GENERAL LIBRARY
MAR 1 1919
UNIV. OF MICH.

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CXLV. No. 2907.] LONDON, JANUARY 28, 1919. [71st Year. Price 8d.

OXIDE OF IRON
SPENT OXIDE

GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C. 2.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 London Wall.

PUMPING ENGINES
All Types for ACID, &c.
CAST-IRON OR STEEL TANKS
Any Capacity.
CHEMICAL PLANT.
Roofs and Girders. Structural Work.
Air and Gas Compressors.
MIXERS.
TAR STILLS AND CONDENSERS.
SULPHATE OF AMMONIA PLANT
W. NEILL & SON, Ld.
Engineers, Iron & Brass Founders,
ST. HELENS JUNCTION.
Telegrams: 'Neill, St. Helens.' Telephone No. 20.

PURIFYING MATERIAL
"Brownox-de-Luxe."
Unqualified Satisfaction given where used.
SPENT OXIDE PURCHASED
J. BROWN & CO., Ltd.
Savile Town, DEWSBURY.

TORBAY
JOINT STOPPING
FREE FROM LEAD.
The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C. 3.
39/41, Old Hall St., LIVERPOOL.

"BLUEBELL"
SILICA RETORTS
(95% SILICA)
John G. Stein & Co., Ltd.,
Castlecary, SCOTLAND.

Makers of
GASHOLDERS,
TANKS (C.I. or Steel),
PURIFIERS,
WASHERS,
ROOFS,
&c.
ASHMORE, BENSON, PEASE & CO., LTD.,
STOCKTON-ON-TEES.
Complete GAS WORKS
London Office
80, Victoria Street, Westminster, S.W.
Telegrams: "GASHOLDER."

W. & B. COWAN
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON. MANCHESTER. EDINBURGH. GLASGOW.
SYDNEY. MELBOURNE. BRISBANE. WELLINGTON, N.Z.
(See Advertisement on page iii. of Wrapper.)

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
89, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

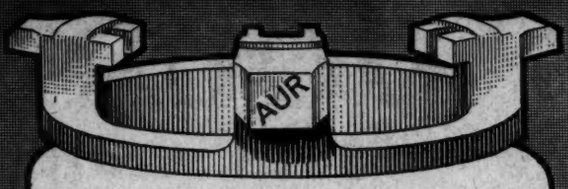
ESTABLISHED — 1861 —
Telegrams: "DRY METERS, LONDON."
Telephone: KENSINGTON, 1140.

George Glover and Co., Ltd.
RANELAGH WORKS
Royal Avenue, Chelsea
LONDON, S.W., 3.

Highest Awards at the Principal International Exhibitions.
Branches at LEEDS (9, Dewsbury Road) and MANCHESTER (Gaythorn Meter Works, Easton St.).

SPECIALISTS IN DRY GAS METERS—SLOT, KEY, AND ORDINARY.
Every meter leaving George Glover and Co.'s works, irrespective of size—and they build up to 3000 Lights—is regulated and tested for soundness at 12 in. pressure, and for registration not only at the ½ in. pressure prescribed by the "Sales of Gas Act," but at 3 in. pressure with full outlet capacity, so as to prevent "slow" registration even when the meter is overworked.
AGENTS FOR THE PATENT M. & M. SELF-LOCKING SLOT METER PADLOCK.

R. & J. DEMPSTER, LTD., MANCHESTER. ELSWICK WORKS, BROADWAY, WESTMINSTER, S.W. 1.
SOLE MAKERS OF THE "EXCELSIOR" & "ECONOMIC" DRY GAS METERS.
"EXCELSIOR" & "ECONOMIC" DRY GAS METERS.
& COAL WASHER.
KITCHIE C.I. PIPES FOR GAS & WATER. MIDDLESBROUGH.



The Welsbach Light Co., Ltd.

THE
WELSBACH
LIGHT CO., LTD.
Welsbach House,
KING'S CROSS,
London, W.C.1
There Are No Better Mantles Made

is an ALL British Company

The Welsbach Factory produces the largest number of Mantles of all Factories in the United Kingdom.

THE
BRYAN DONKIN COMPANY, LTD.
SPECIALISTS IN
HIGH PRESSURE GAS DISTRIBUTION.

PIONEERS IN THIS COUNTRY

OVER 200 PLANTS SUPPLIED FULFILLING ALL CONDITIONS.

We shall be pleased to send one of our Experts to advise.

OUR PATENT DISTRICT GOVERNORS reduce from any pressure on the inlet up to 50 lbs. per square inch in one stage, down to the ordinary district pressure, and the low pressure is maintained constant, independent of all variations in demand and in the pressure on the inlet side.

HIGH & LOW PRESSURE SERVICE REGULATORS.
REGULATORS FOR METERS, GAS FIRES & STOVES.
PATENT DOUBLE FACED GAS VALVES FOR HIGH & LOW PRESSURES.
RATEAU TURBO GAS EXHAUSTERS FOR BOOSTING, &c.
ROTARY & RECIPROCATING COMPRESSORS.

Head Office and Works: CHESTERFIELD.

London Office: 3, VICTORIA STREET, WESTMINSTER, S.W. 1.

Chesterfield Telephone No. 84.
London Telephone No. 5368 Victoria.

Chesterfield Telegrams, "Donkin Chesterfield."
London Telegrams, "Donkin Vic. London."

GAS JOURNAL

LIGHT · HEAT · POWER · BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLV., No. 2907.] TUESDAY, JANUARY 28, 1919. [71ST YEAR.

EDITORIAL NOTES.

Labour Movement and the Gas Industry.

THE wave of demand and irresponsible action on the part of sections of labour has reached a volume which is producing corresponding indignation throughout the country. The miners, the railwaymen, and other elements in the labour world have taken upon themselves the *rôle* of the despot. Loyalty to leaders and compacts have no significance among some of them to-day. Extremists are in the van. For them and those who follow them orderly rule and procedure are dead; and demands large or trivial must be conceded at once, without discussion, or there is the inevitable threat of a strike, which threat ascends from sectional to national dimensions according to what is deemed to be the necessity for tightening the screw to compel compliance, immediate and full. There is no thought of duty as between man and man, no thought of patriotism, no thought of present or future effect—the labour demand to-day is simply a command. There must come a break in this condition of things. The country and its industries and trade cannot stand the strain. Labour is thoughtlessly exercising itself in constructing channels for easing competition from abroad, and blocking the channels to export trade, by strangling our own competitive power. This has been time and again pointed out to them, and by men from among themselves who are reasonable, and who view things, present and prospective, from an intelligent standpoint. But the fever for gain in wages, with shorter hours, and less production per man per day, is upon extensive groups of labour; and selfishness and a total disregard for the effects dominate. The forty-hour week, the forty-four hour week, or the forty-seven hour week is being sought by different sections of workers. In the engineering and shipbuilding trades, the forty-seven hour week has been conceded. Already there have been some local strikes over details in the application of the shorter week; and threats of others if the men's views are not adopted without demur. The latest rupture is at Belfast, in connection with the forty-four hour week in the shipbuilding and engineering shops there, with the municipal workers lending their weight to enforce the demand, and so depriving the community of gas, electricity, and tramway services. Labour is having recourse to the tyranny of numbers and force.

Short as coal supplies now are, in spite of the release of 173,000 miners from the army, 150,000 miners in Yorkshire stopped work last week, over the question of a twenty-minute dead-stop for the refreshment of surface workers. There was settlement by conceding the demand at (it is said) the instance of the Coal Controller. This is only a further exemplification of the following of the line of least resistance, which has become such a favourite track of statesmen and bureaucratic heads since labour first took advantage of a national crisis to force the country into those roads which, if it continues to travel them, must inevitably end in catastrophe. There is something more portentous ahead. There is the miners' 30 p.ct. increase of wages and the six-hour day. The 30 p.ct. alone means an addition to the cost of coal of 4s. per ton, which will make a new charge variously estimated at 40 to 50 millions sterling per annum. On the coal bill of the much over-burdened gas industry, the addition would represent another £4,000,000 a year; and this will necessitate at least a further 4d. per 1000 c.ft. of gas to all consumers—the poor prepayment, the ordinary, and the industrial consumers alike. There will have to be a fresh appeal, too, to Parliament on behalf of the investors in the gas industry. They cannot go on indefinitely with a miserable 3 p.ct., and in some cases less, with their own individual costs ascending as they are doing through the same causes that are compelling repeated advances in the price of gas. There should, in justice, be early revision in favour of the investor. Even the conditions that existed at the time the appeal for relief was formerly made to Parliament are now hidden under the fresh conditions of to-day; and these will, if further extravagance in labour demand succeeds, also soon be buried out of sight.

Adding to the shadows over the country is the miners' proposal for a six-hour day, the claim for which is based (at the same rate of pay as for the longer day, and so at a higher cost of production) not so much on physical disability as upon the need for absorbing the men returning from the forces. Already the miners state that the supply of men in some districts exceeds the present scope of employment. Yet the country is short of coal; and the coal mines before mobilization gave employment to the men who are now being demobilized. These are the facts; their by-passing is only to be accomplished by the objection of the miners to the men who have been working by their sides, and who migrated from other industries, being deprived of continuing the privilege of working in an industry in which payment is high and average hours of work and production per man low. The move, made possible by a surplus created by retaining men who before the war were untrained as miners, is a wily one. But the process of demobilization is not confined to the fighting front. It is taking place on the home front; and those men who gravitated to the coal-pits from other industries ought now to be demobilized, and returned to the industries whence they came. The railwaymen are also making for additional wages and a further modification of their conditions of work.

It is abundantly clear that war time cost conditions are going to pursue the gas industry far into the future; and, with the present movement in the labour world, the peak of the costs load has not by any means been reached. To the extra burdens that are flowing in from external sources, wages and hours conditions within the industry are to undergo further discussion; and this immediately. The last settlement of wages has not left the industry long in a composed, though burdened, state. The National Federation of General Workers have also adopted (as is known) the policy of a forty-four hour week; and the Federation comprise ten Trade Unions with an aggregate membership of not far short of a million workers. Among the ten Unions are the National Union of General Workers (of which Mr. Will Thorne, M.P., is the General Secretary), the Amalgamated Society of Gas, Municipal, and General Workers, and the Dock, Riverside, and General Workers' Union. In view of these general movements, it is not a politic thing to take isolated action, as has been done by Halifax, in all good faith and spirit, in granting the forty-seven hour week to gas-workers. The indications are that Halifax may be told from outside that a further step downwards in the hour scale will have to be taken. Current events suggest that it would be better that these matters should be dealt with on a united basis, and not an individual one. Individual settlements do not always square with the ideas of a Trade Union Federation, nor with settlements that sooner or later will have universal application.

Gas Research Sub-Committee's Reply to Critics.

THE Research Sub-Committee of the Gas Investigation Committee have now presented [see p. 167] their reply to

the discussion which took place on their first report at the autumn meeting of the Institution of Gas Engineers. The discussion, it will be remembered, was largely critical; and therefore the reply is in the main in the nature of a defence. The criticism fell heavily upon the gas-consuming appliances employed by the investigators, and the deficient results realized from them. The Committee were in a measure to blame for the trend the discussion took. The reply, however, clears the air considerably, and puts us into closer touch with the work and the intentions of the Committee, from whom, as the research progresses, it is hoped to get results which will completely obliterate the feeling that, through the gas consuming appliances originally employed, a start was made at the wrong place, or that there was an error of judgment. No one, so far as we know, questions the trustworthiness of the results of the first part of the investigation as realized from the impugned appliances, but there is questioning of the trustworthiness of the results from these appliances as affording any safe guidance. It follows that, if the appliances in which the gas was consumed were in any wise defective, whether the results were good or bad, they could not be utilized as showing positively the behaviour of gases of different grades or mixtures.

In the opening paragraphs, we have the defence on this particular point; and we will extract a passage from it, and then presently put into comparison with it one from a later part of the report. The first passage reads: "An investi-" gation which has for its object the comparison in use of " different grades of gas, and particularly one which aims " at providing reliable information on the subject of new " standards, must obviously take into full account in the " first instance the comparative efficiencies in the appli-" ances of to-day." The low results secured with an upright incandescent burner indicate that there was something wrong with the burner or imperfect contact of the mantle with the flame; and therefore the condition of things was not what should represent a lighting appliance of to-day. Already we have it acknowledged that, in a further series of experiments, the use of another equally representative and widely-used burner has given higher efficiencies, and the limiting values as regards calorific value are somewhat different. Then, again, the use of a fire with unsuitable radiants and faulty aeration was not, we may hope, representative of the appliances of to-day. The second passage from the Committee's reply—here dealing with ring-burners—which we wish to compare with the previous quotation reads: "While " admitting that the foregoing conditions represent practical " usage in many cases, they show an unfortunate disregard " of the conditions essential to economy; and it would be " unwise to adhere to them in an efficiency investigation " merely because they represent (bad) practice." Why was not this principle applied in the initial stages to the tests of incandescent upright gas-burners and gas-fires? A principle that is good for ring-burners should be equally good for other gas-consuming devices. This is one of the reasons that we should have preferred an inverted burner to be first used, because just as the upright incandescent burners displaced flat-flames, so the inverted form is superseding the upright type, and is the most popularly approved burner to-day. Moreover, the smaller mantle of the inverted type offers the best available means for the testing of different mixtures of gas, seeing that the volume of flame is sufficient for larger variations in the size and shape of mantles than is the case with upright mantles.

It is fully realized that "the public interest, the informa-" tion of the gas industry, and the correction if need be of " ill-founded statements, all demand that we should be able " to speak on the basis of results obtained from both types " of burner, and from the one as compared with the other." Nevertheless, we should have chosen, in the interests of the gas industry, that the order of testing should have been reversed; so that results of the best rank saw the light of day before those of lower rank. The public interest and that of the gas industry both require that we should show lay users the best that can be done, and that this best is what they can enjoy, if they are wise. The same with those parliamentary authorities who will have final determination on the subject of standards—the earlier they can have presented to them the best that can be done with available appliances, the better the chance of the industry to secure permanent relief to enable the retention of the progress in economical manufacture that has been made during the war. As already pointed out, too, the (as yet) unpublished results from another upright burner are better than those from the one included in the first report; so that we should be doing ourselves an injustice by speaking to the public on the basis of the results from the first burner employed. However, the Committee are not going to spare themselves in making investigation complete. All will come in time—the same investigations with inverted burners and other unimpeachable appliances; and it is hoped to carry the inquiry even beyond the normal efficiencies of to-day.

We agree with the Sub-Committee that, for technical purposes, it is quite sufficient to express gas-fire efficiency results in terms of radiant efficiency only. But there is the danger of this course giving the impression outside that the stated efficiency is the total efficiency of the gas-fire; and therefore the efficiency limitation should be made abundantly clear in the reports, so that the saving of the time and lightening the work of the experimentalists should not prove to be to the disadvantage of the gas industry. A good defence is made by the Committee of the methods they adopted in their investigations of boiling-burners with different gas compositions. There would have been a distinct loss in the educative value of the investigation had they pursued any other course than that of finding the best conditions—particularly as to the paramount one of distance from the top of the burner to the bottom of the vessel—governing use with different grades and mixtures of gas, and therefore with different length flames. The report distinctly evidenced the fact that reduction of calorific value is not to blame with ring-burners for loss of efficiency, but that it is due to loss of flame contact. Hence the need for determining the satisfactory height above the burner at which the base of the water-containing utensil should be, with the change of flame condition produced by altering the character of the gas. The question of the need, too, for the use of heating utensils with bottoms bearing proper relation to the size of the ring burner is also important; and if gas undertakings would only set about educating their customers as to the need for having regard to this relationship, they would contribute greatly to kitchen economy and consumers' satisfaction.

The protest that was made against the Sub-Committee's mention in their first report of 525 B.Th.U. gross as being the calorific value at which the maximum attainable illumination was found with the upright incandescent burner employed, they regard as unjustified; and they repudiate any intention on their part of as yet specifying a figure which, in their opinion, should represent the future standard of gas. It is acknowledged there is a vast area of ground still to explore, which comprehends not only the efficiency of appliances, but also of manufacturing economies. It may be that eventually a figure as a standard will have to be struck which may not represent either the maximum of efficiency in use or the maximum of economy in manufacture, or efficiency may have to give way a bit to economy or economy to efficiency. Meanwhile, there is a desire that accrued economies shall be preserved to the industry; and therefore care should be exercised to avoid anything which may be taken to be the expression of authoritative opinion as to a standard which may be noxious to the interests of the industry. This point as to a standard calorific figure and other misconceptions are cleared away by the Sub-Committee in their reply, which varies in strength in its different parts. Those who engage in similar research will find, presented as appendices to the reply, a couple of extremely useful tables.

Prof. J. W. Cobb on the Relation of Gas and Electricity to Coal Conservation.

WHEN Prof. John W. Cobb gives us the results of an analytical or critical examination of a process, a report, or anything else, he is always instructive; he brings a clear perception, a studious mind, and extensive knowledge to bear upon the work. To the "Edinburgh Review" for this quarter, he contributes a valuable article [noticed elsewhere in this issue], in which he scrutinizes the final report of the Coal Conservation Committee of the Ministry of Reconstruction. After reading the critique, we are left with our previous conviction considerably hardened that the constituent report of the Power Generation and Transmission Sub-Committee suffers from defects in substance, scope, method, and recommendation which should be sufficient to nullify it as supplying any safe foundation for legislation. In short, the trouncing that Prof. Cobb gives the Sub-Committee's report should, with a Government in less of a hurry than the present one

to get a move on in the matter of schemes of reconstruction, produce deferment and widened reinvestigation.

As a matter of fact, inquiry commenced at the wrong place. It is a reflection on the qualification for the work, or perhaps upon the bias of professional training and interests, of some of the members of the Sub-Committee that the scope of inquiry was so narrowed. And it is also a reflection upon the Coal Conservation Committee that they should have adopted and blessed the reports and recommendations of the three Sub-Committees concerned, apparently quite oblivious of the fact that there was much in the several reports that is antagonistic. There is likewise much in them that shows that investigation of matters of such vast national and economic importance should not begin only at things as they exist; certainly it should not in the result display such magnificent superficiality and grotesque calculation, as are found in the report of the Power Sub-Committee. This is a case of coal conservation; but there is not a trace throughout the report of the matter referred to the Sub-Committee having been dealt with scientifically at the very base. No engineer would hazard the erection of a heavy structure before taking the precaution of proving the foundations; but this Sub-Committee had no hesitation in propounding schemes involving millions without troubling to get beneath the surface. In such a matter as that of coal conservation, and the disturbance of existing conditions in relation to power, light, and heat, the order of procedure should have been scientific investigation, by (let us say) the Fuel Research Board. Then on the results of the investigation, there should have been inquiry as to the methods best calculated to realize national economy and other benefit from the scientific utilization of our fuel resources.

If robust argument and clear exposure, with a vein of gentle sarcasm running through, are sufficient to kill the results of defective investigation by a Government Department, Prof. Cobb in his article should have accomplished this, in the present instance, beneficent end. But the Government and the Board of Trade are proceeding as though the reports that have been made constitute the last word in the matters of coal conservation and the reorganization and réformation of the electricity supply industry. The truth is, in regard to coal conservation, that even when the super-stations come along, the gas industry will have nothing to fear from the point of view of the economy it can offer in power and heat over electricity in relation to the coal expended. After reading Prof. Cobb's article, we feel more than ever that, if the Carbonization Sub-Committee had but done its duty thoroughly, it could, without anticipating the results of the work of the Fuel Research Board, have stated a case for gas which would have shown that electricity was not the main road to coal conservation. If all the inquiry work of the Ministry of Reconstruction is open to such destructive criticism as is the report of the Power Sub-Committee, then we may resign ourselves to a mass of miscarriage in so-called national reformation and reconstruction. The Government are most anxious for some good constructive work in the interests of the country, and the Ministry of Reconstruction are hoping to do something of real worth. It will therefore be a pity if excellent desire and willingness fall victims to indifferent exploration and to pure assumption.

The Electrical Scheme Imbroglio.

THE good intentions of the Government regarding the regeneration of the electricity industry, and the placing of its operations under more rigid control than that to which it has hitherto been subject, are found to be out of harmony with a not negligible mass of opinion within the industry, supported by organizations of considerable power outside it. We gather this from a statement sent to the President of the Board of Trade by the Institution of Electrical Engineers, on behalf of a Committee speaking for some dozen organizations besides the Institution, which alone represents several thousands of men concerned professionally or otherwise in electricity supply. Among the bodies supporting the action of the electrical organizations (the Incorporated Municipal Electrical Association is not one of them for reasons which our "Electricity Supply Memoranda" have lately shown) are noticed the Federation of British Industries and the Iron and Steel Institute. These are Associations of men who are largely concerned with the progress of the more important industries and private enterprises, and to whom "State Control" or "Nationalization" is very obnoxious. Much as the Prime Minister would like to appease labour by a policy of nationalization, the Government cannot possibly treat disrespectfully the opinions of those who have created and developed the industries of this country, and to whom we have primarily to look for further expansion of manufactures and trade. The Government will find themselves dragged one way or the other by two powerful forces; and, when these questions get before the House, the Government will be plunged into much-troubled waters. It is by no means a plain-sailing expedition upon which they are embarking.

The statement from this composite Committee agrees that drastic reform of electrical enactment is necessary if the industry is to fulfil its functions of providing cheap and abundant electricity for industrial, agricultural, and domestic purposes. In addition to releasing electrical enterprise from existing disabilities, the chief necessities of the situation, according to the document, are: (1) The treatment of the problem of electrical generation and distribution on broad lines; (2) provision of simple forms of procedure in obtaining power for electric utilities of all kinds. It will be necessary for other statutory industries to see that the electrical industry, in seeking for release from statutory enactment and for a simplified form of procedure in obtaining powers, does not secure anything of a preferential nature. The gas industry, for example, desires release from certain disabilities which shackle its progress and its inherent competitive power; and it would also like to share in any simplified procedure in realizing parliamentary powers. The statement, however, shows that the subscribers to it are not in sympathy with the revolutionary proposals of the Departmental Committees who have reported on the reorganization of the electrical industry. They favour the recommendation as to the appointment of a Board of Electricity Commissioners composed of skilled men, free from political influence; but they want their functions curtailed, and the concomitant scheme largely sacrificed. The immediate creation of a Board of Electricity Commissioners is advocated; but it is held that there should be a gradual development of the administrative machinery as the necessity is felt. Otherwise the industry may be hampered by excessive organization. The functions of the Commissioners should be to examine proposals for the extension and consolidation of existing electrical enterprise, and to recommend to Parliament or the Board of Trade for authorization schemes which commend themselves as being on the soundest of financial and engineering lines. Also the Commissioners should advise the Government on legislative matters for encouraging the electrical industry. In short, the functions of the Board should be exclusively judicial and advisory. There agreement ends with what has been proposed by the Board of Trade Committee. The subscribers are opposed to the Board having administrative powers over electrical undertakings, or authority to appoint District Boards, in the event of such bodies being constituted. Schemes (which would as part of their purpose embody the absorption of uneconomical concerns with judicious consolidation) should be initiated and formulated by the existing undertakings, and then be examined by the Commissioners, who should report to Parliament. The Board might also be empowered to deal with electrical rules and regulations. Beyond this the subscribers to the statement regard as impracticable general legislation to establish the business of electricity supply on new lines.

What will the Board of Trade and the Government have to say to this influential representation? They find their schemes supported only in part by municipal suppliers. The statement portends something more serious. It indicates a vastly superior weight of expert opinion than the Committees who have reported could boast in favour of a reduction of the schemes to a partial recognition of only one constituent of the proposals. The Government, in fine, are desirous of reforming a largely unwilling industry—an industry that wants to pick out just what suits it, and abandon the rest. Did the Board of Trade Committee construct their scheme on the evidence placed before them, or did they evolve it out of their own imagination? If the former, then the large opposition is inexplicable; if the latter, then the conception of this relatively small Departmental Committee does not represent the opinion of a larger tribunal composed of the major part of the industry itself, and supported by a wealth of external industrial influence. Will the Government face these facts, and defer action until they are better advised as to the needs of the industry?

The National Benzol Association.

The National Benzol Association has (as will be seen by the extracts from the revised Constitution and Rules on a later page) extended both its scope and base. The word "Benzol" is now taken to include crude benzol, refined benzol, and its homologues, and now producers of crude as well as refined benzol may be members. The form of the first three "objects" of the Association, it will be remarked, has been altered; and the scale of subscriptions has been modified. Producers of crude benzol who are not refiners are asked for a contribution of only 1s. per 1000 gallons; refiners, 2s. per 1000 gallons of refined benzol or its homologues; and refiners who purchase crude benzol, 1s. per 1000 gallons bought, and 2s. per 1000 gallons of refined from their own crude production. The number of areas from which members of the Executive Committee are to be drawn has been increased from five to eight; and changes have been made in the numerical composition of the Committee.

Coke-Ovens and the Manufacture of Sulphuric Acid.

Developments in the coke-oven industry point to the purification of the bye-product gas for supply to gas undertakings purchasing it in bulk; and the utilization of the recovered sulphur for the production of sulphuric acid for, among other uses, the manufacture of sulphate of ammonia. This extension of processes to sulphuric acid manufacture is foreshadowed in the opening of a paper which Mr. G. Chrisp read before the Midland Section of the Coke-Oven Managers' Association last Saturday. "Although," he said, "sulphuric acid is not at present regarded as a bye-product of the coking industry, the probabilities are that in the future it will be recognized as such, by reason of developments in processes for the recovery of the sulphur compounds in our coal." The paper was descriptive of the manufacture of acid by the chamber process; and Mr. Chrisp's survey (published in this issue) of the work and plant involved will be found to give in concise form information which will be of considerable value to those coal carbonizers who are thinking of extending their operations in this direction.

Road Repair and Dehydrated Tar.

There has been considerable damage to the main roads of the country during the war, in consequence of the heavy traffic over them, supplemented by the inability to keep them up to the usual standard of repair owing to the lack of men and material. Now there is a vast amount of arrear work to be done; and £10,000,000 has been entrusted by the Government to the Road Board for distribution in helping to reinstate the roads. The gas industry has a large amount of dehydrated tar and pitch in stock which it could not dispose of during the war; and these substances should come in handily to the road authorities, to the profit of the gas undertakings. They will be glad enough to have relief for their overcharged stores.

Increased Production and a Share in Prosperity.

Attention is arrested by some passages in a thoughtful speech delivered last week by Mr. J. R. Clynes, the late Food Controller; and more so because we believe he is still an official of the Union which can claim a great number of gas workers as members. Speaking of the present labour unrest, he said, in his opinion, employers had made a great mistake in wholly failing to recognize the change in outlook and spirit of the workers. In the past, too, employers had not offered to share in prosperity with their workmen, but had only had recourse to the argument of force. It was not therefore surprising that the men only recognized force as their one remedy. On the subject of the need for increased output, he also said that this could come by skill and organization on the part of the captains of industry; but it could not come "unless workmen readily and frankly accepted what he believed was the truth, that their interests as workmen lay in their being real and willing partners in the enterprise of enormously increasing the production of the country." This carries one's thoughts back to the time when co-partnership was introduced into the gas industry by the South Metropolitan Gas Company. The attitude of the Union whose members were most intimately interested was then not friendly towards co-partnership; and yet the London gas-works to-day demonstrate by numerical means that there is nothing in co-partnership that is repugnant to the principles of trade unionism. Trade unionism and co-partnership can, and do, work together in perfect amity. If we interpret Mr. Clynes' remarks correctly, he at all events recognizes that co-partnership is the highway to increased production. If the unions would only adopt reasonable standards of wages for the class of work upon which men are engaged, and those wages be supplemented by a share in the profits, which would be greater the better the management, the organization, and the willingness of the men to put forth their best efforts in increasing production, the happier would everyone be, and the wealthier would the country and its workers—brain and hand—become.

New Competitive Movement.

It cannot be emphasized too keenly that the British Commercial Gas Association are taking, and will have to take, a progressively vigorous part in promulgating information for advancing gas trading interests. Intensified pressure is coming from outside; and this will necessitate intensified pressure from our side, in order to make headway. With all the publicity that has been given in the "JOURNAL" to the matter of the Government intentions as to electricity supply, and to the hope of the electricity industry to increase the use of electricity for power and heating purposes, gas managements observant of the trend of affairs must have had their eyes opened wider to the fact that these are not times for indolence and indifference. It will be seen from the reference made in another column to the report of the Executive Committee of the Association that they have this matter of new competitive movements well in hand, and that the preparations for prosecuting a spirited campaign are developing. "To make clear to the nation that the use of electricity as a heating agent is contrary alike to public policy and private interest" will alone be an excellent piece of work.

Housing Schemes and Maintenance Policy.

But the Association have much else to follow up. The new housing schemes supply a promising field for effort. We have seen no striking evidence yet that the importance of this work has taken firm hold of gas undertakings generally. The Association are very much alive to the importance, so is the electricity industry, and so are the powerful firms manufacturing for the industry. There must be no weak half-measures on the gas side in dealing with this matter. The widespread demonstration of economy and labour-saving service of gas in the new class of houses that are going to be erected about the country will have inestimable popularization value, providing gas undertakings rise to the occasion, and see, by inspection, that the appliances they supply are maintained in good order. Lack of systematic maintenance is a powerful enemy to gas in not a few gas-supply areas; but, as more men become available, the periodical inspection and maintenance policy should be revived or started. Gas consuming appliances during the war have been largely neglected; and low efficiency, with waste of gas, constitutes a condition which is very favourable to the yielding to temptation to try the wares of competitors. But this by the way. The Association, it is seen, have now supporters representing 85 p.ct. of the gas supply of the country. Why should the percentage not be 100? We see every reason why it should be—and with subscription at top level. There is great work to be done; and every extra twenty shillings contributes to sovereign effectiveness.

At a meeting of the Society of Engineers to be held next Monday in the apartments of the Geological Society, Burlington House, W., Mr. W. Noble Twelvetrees will deliver his Presidetial Address. The time of the meeting is 5.30.

A paper on the "Petrography of Sedimentary Rocks, with Special Reference to the Coal Measures," will be read by Dr. A. Gilligan, F.G.S., at a meeting in Leeds next Thursday of the Midland Institute of Mining, Civil, and Mechanical Engineers. A paper on "Coke-Oven Practice," by W. Colquhoun will also be open for discussion.

Under the auspices of a Joint Committee of the Newcastle Section of the Society of Chemical Industry and of Armstrong College, a course of five lectures on "Refractory Materials" is to be delivered by Dr. J. W. Mellor, of Stoke-upon-Trent. The lectures will be given weekly (at the Mining Institute, Newcastle), beginning on Feb. 19. For the course, a fee of half-a-guinea will be charged, or 2s. 6d. for single lectures. Members of the Society of Chemical Industry and of certain kindred societies can, however, obtain tickets at half these rates.

GAS LIGHT AND COKE COMPANY'S DIVIDEND.

WE are notified by the Secretary (Mr. W. L. Galbraith) that the accounts of the Gas Light and Coke Company for the past year show that, subject to audit, the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend for the half year to Dec. 31 at the rate of £2 13s. 4d. p.ct. per annum on the 3½ p.ct. maximum stock, and (with the approval of the Board of Trade) a dividend at the rate of £3 p.ct. per annum on the ordinary stock—carrying forward to the next account the sum of £380,744 1s.

NATIONAL GAS COUNCIL OF GREAT BRITAIN AND IRELAND.

A MEETING of the Executive Committee of the Council was held last Thursday, when the following matters were considered.

The Chairman of the Executive Committee and Mr. W. E. Price were appointed to represent the Council on a Committee which is to meet at the Board of Trade for the discussion of the composition, quality, and pressure of gas.

It was reported that the Treasury had not yet agreed to make any subsidy in respect of the cost of gas oil in stock at gas-works on the 15th of December, but that the Controller of Coal Mines was being approached on the matter.

A letter from the Coal Mines Department of the Board of Trade, regarding the increasing stocks of gas coke accumulating in certain districts of the country, and authorizing larger supplies to certain industrial users, was submitted. [A notice to this effect appeared in the "JOURNAL" last week.]

A report from Mr. P. E. Williams on the position of the spent oxide market was submitted; and it was decided to circulate the report among the members of the Committee, and to give further consideration to the whole matter at a subsequent meeting.

Arising out of representations made to the Coal Mines Department of the Board of Trade, urging an increased allowance of gas per ton of coal under the Household Fuel and Lighting Order, it was reported that the gas ration in England and Wales had been increased by 25 p.ct. as from the 1st inst.

A letter from the Ministry of Labour Civil Demobilization and Resettlement Department was submitted, suggesting that the Council should forward the names of employees in the gas industry (particularly stokers) whose early demobilization from H.M. forces was desired. It was reported that a request for such information had been sent to the Technical Press for publication, and that certain lists of names had been forwarded to the Department. The latest date for receipt of such lists was yesterday (Monday) morning.

A letter from the Federation of British Industries, requesting the Council to appoint a representative on a Fuel Efficiency Organization Committee, was submitted; and Mr. E. W. L. Nicol was accordingly appointed to serve on the Committee, as it appeared primarily to affect coke interests. But he was asked to report the result of each meeting to the Council, in order that if and when questions affecting the use of gas as fuel arose, they might have an opportunity of appointing a further representative to deal with that section of the inquiry.

The formation of an Association of Great Britain and France for the encouragement of trade between the two nations was reported.

As a result of the application of the Council to the Ministry of Labour for the gas industry to be represented on the Local Advisory Committee appointed in connection with the national system of Employment Exchanges for dealing with demobilization, it was reported that a letter had been received from the Ministry stating that the importance of the gas industry had not been overlooked, and that gas undertakings had been accorded representation on several of the Committees. The Ministry promised to give consideration to any application put forward on behalf of any particular district still requiring representation. The Committee decided to communicate with the various District Institutions and Associations of Gas Engineers on this point.

The financial position of the industry was again discussed; and a draft form of inquiry, which it was suggested should be sent out to gas undertakings, was submitted.

It having been reported that the work of the Industrial Transition Committee of the War Cabinet Demobilization Committee had been placed under the supervision of Sir Eric Geddes, the Committee asked Mr. Jacques Abady to investigate and report upon the proposals of the Government for the relief of other industries suffering financial difficulties.

The Committee discussed the Government electrical programme, and decided upon certain action in connection therewith.

Conference on Salaries.—A meeting was held in Birmingham last Thursday week to consider the question of salaries, but was adjourned; a Sub-Committee being appointed to make inquiries and report.

PERSONAL.

By reason of his technical knowledge and long experience, Mr. C. STAFFORD ELLERY will be a valuable acquisition to the Board of the Bath Gas Light and Coke Company—to a seat at which he has been elected in succession to the late Alderman J. E. Henshaw. Mr. Ellery was Engineer to the Company from 1880 until 1914, when he was appointed Consulting Engineer.

At a meeting of the Directors of the South Shields Gas Company last week, Mr. DUGALD CURRIE, of Nelson, was appointed to succeed the late Mr. T. H. Duxbury as Engineer and General Manager. Mr. Currie, who was previously at Airdrie, became Gas Engineer and Manager to the Nelson Corporation in 1915, on the removal of the late Mr. A. Morton Fyffe to Blackburn. After serving his articles with Messrs. Hanna, Donald, and Wilson, of Paisley, his earlier years in the profession were spent in the gas-works at Stirling and Belfast.

After considering some time ago various applications for the position of Assistant Engineer, the Directors of the Bath Gas Company decided to appoint Mr. KENNETH GANDON (who was their junior assistant there) for three months on trial. This period expired at the beginning of the present month; and he has now been permanently appointed Assistant Engineer and Manager. Mr. Gandon is a son of the late Mr. John Gandon, who was Engineer and Manager of the Ottoman Gas Company at Smyrna. He was an articled pupil to Mr. S. Y. Shoubridge, at Lower Sydenham, and remained there for a couple of years after his pupilage. In 1916, he became second assistant at Bath.

Mr. ALEC E. WHITCHER, of Burgess Hill, has been appointed Engineer, Manager, and Secretary to the Haywards Heath Gas Company, in succession to the late Mr. P. P. Channon. He started his career at the Gosport Gas-Works, and was subsequently appointed Assistant to Mr. W. H. Ely, at the Woking Gas-Works. Afterwards he went to the Hawkhurst Gas Company as Manager and Secretary, which position he held for three years. While there he built a complete new gas-works—relating his experiences in a communication to the Society of Engineers, which was noticed in the "JOURNAL" at the time. Mr. Whitcher left Hawkhurst on being appointed Engineer and Manager to the Burgess Hill Gas-Works, where he has been "steaming" with horizontal retorts on a system of his own in connection with which patents have been applied for.

Mr. J. F. BAYLY, the Inspector of Coal, Gas, and Water in the Education Officers' Department of the London County Council, is retiring at the end of this month on a pension.

As the restrictions on the use of motor spirit for civilian purposes are no longer necessary, and control has ceased, Sir EVAN JONES, Bart., M.P., has resigned his position as Controller of Petrol.

OBITUARY.

The death, at the age of 76, has taken place at Ayr (where he has officiated for some years past as Bailie), of Mr. WILLIAM SMITH, who was for 23 years the Engineer and Manager of the Bolton Corporation Gas-Works. He retired in 1909, and was succeeded by his son, Mr. W. J. Smith, B.Sc. Another son, Mr. A. H. Smith, is Gas Engineer and Manager at Darwen. In 1907, when Mr. William Smith had completed 21 years' service at Bolton, he was presented by the employees with an illuminated address and a silver loving-cup. It was then stated that during the time he had been at Bolton the make had increased from 579 to 1029 million c.ft. per annum, and the make per ton from 9871 to 10,567 c.ft. Both the Gas Street and Lum Street works were entirely remodelled, and new plant of all kinds erected to Mr. Smith's designs, and under his directions. On his retirement, his services to the town were handsomely acknowledged by the Chairman of the Gas Committee. He was a native of Ayr; and previous to going to Bolton, he was connected with the Coatbridge and Darlington Gas-Works.

One of the old-time members of the gas industry has passed away in the person of Mr. SAMUEL WHILE (aged 78 years), who was a native of West Bromwich. In 1871 he and Mr. Ashmore founded the firm of Messrs. Ashmore and While, gasholder and gas plant manufacturers, of Stockton-on-Tees; and they built, among many others, the then largest gasholder in the world, of 5 million c.ft. capacity, for the South Metropolitan Gas Company, at Old Kent Road. In 1884 the partnership was dissolved, and Mr. While came to London to represent the newly-formed firm of Messrs. Ashmore, Benson, Pease, & Co. After a year or two, he gave up this post, to become London representative of Messrs. Clayton, Son, & Co., Ltd., of Leeds, for whom he has acted ever since at No. 60, Queen Victoria Street, E.C. In this way, he was also interested in the 12 million c.ft. gasholder which the firm erected at East Greenwich for the South Metropolitan Gas Company. Deceased (who had been in failing health for some time before his death) leaves two sons. Mr. While was the owner of several small gas-works, and was also a Director of other gas companies.

A CRITICISM BY PROF. COBB

OF THE REPORT OF THE POWER SUB-COMMITTEE OF THE COAL CONSERVATION COMMITTEE.*

Gas Supply v. Electricity from Super-Power Stations.

IN the current issue of the "Edinburgh Review," Prof. John W. Cobb makes (as mentioned in our editorial columns) a critical examination of the final report of the Coal Conservation Committee of the Ministry of Reconstruction—particularly of the section constituting the report of the Power Generation and Transmission Sub-Committee. The gas industry is in a transitory position, and so is the electricity supply industry; and what is ultimately done in connection with the one must have an influence upon the other. But whatever is done in regard to the one or the other must have a perfectly sound foundation, and not one that is composed of nothing much better than hypotheses. Every person who is technically interested in the movements of the times in respect of light, heat, and power should read Prof. Cobb's cogent criticism; for it shows with incisive clearness the shallowness of the work and the decisions of the Power Sub-Committee; and it proves conclusively that, in the economic interests of the country (especially from the standpoint of coal conservation) the investigation has not gone far enough to warrant for electricity preferential legislation and financial support by the Government. Electricity generation and transmission, in short, form only one and an indivisible part of a much larger problem affecting our national economy.

We may pause over Prof. Cobb's opening phrase: "A belief is coming to the fore that in many of our principal industries neither commercial competition nor voluntary co-operation is sufficient by itself to bring these industries into the high state of efficiency which the national welfare demands." We are afraid this belief could be proved true of some industries; and if ever there was an industry that has been self-condemnatory as to the lines of its conception, development, and management, it is the electrical industry. And in its struggles to mend matters, it has endeavoured to branch-out into business which it is an easy matter to show is not conducive to national economy or to the best use of our coal resources, while there are (thermally and otherwise) economically superior methods available. But, admitting that there are inherent obstacles in some industries to development, that the long-view is not taken by present managements, and that there is a tendency to ignore the future consequences of present activities, the only alternative to the improvement of the individualistic system is national councils. And here we share the author's doubts as to their capacity for improvement, and his fears as to the bureaucratic endowment of mediocrity.

The inquiry by the Coal Conservation Committee originated, there can be no question, in the conviction that we were not making the best use of our great national reservoir of heat energy, which we were likely to want badly in the future not very remote, and were tapping it too freely and wastefully. But if this be so—viewing the reports as a whole, or the Power Sub-Committee's report alone—they do not indicate a way to positive reforming action which is supported by any reliable evidence; and in adopting the reports and the recommendations without any attempt at co-ordination, it is plain the Coal Conservation Committee has followed the line of least resistance, and so fully merits the trenchant castigation to which Prof. Cobb submits its action. As a sample of the antagonism between the reports, take this:

> While the Power Generation and Transmission Sub-Committee points to great central stations generating power by steam and collecting surplus gas and waste heat as the proximate ideal, and asks that large powers of compulsion should be granted to officials for the purpose of realizing that ideal, the Carbonization Sub Committee is evidently of the opinion that steel-works and coke-ovens should be so combined and laid-out as to use their own gas and heat for the generation of all the power they require in gas-engines.

The author, in our opinion, quite correctly gauges the cause of defect in the investigation by the Power Sub-Committee when he writes:

> It was plain from the first that many questions within the scope of the inquiry could not be decided on the basis of existing knowledge, but necessarily involved research which a Committee, with no permanent staff or resources for the purpose, could not undertake. The importance and immediate necessity of what is described as a "chemical survey of the coalfields of this country" was recognized, and ultimately the Government met the difficulty by the establishment of a Fuel Research Board, with Sir George Beilby as Director.

In other words, the national purpose for which the Committee was appointed has been prejudiced fundamentally by an absence of information which could only be obtained by research; and all they have attempted to do is to prove by arbitrary figures that certain visionary economies may materialize in certain events through electricity. But this is a question of coal conservation in relation to power generation, which the Committee extended to comprehend lighting and heating; and the Committee fell into the error of assuming that the only way to coal conservation is *viâ* electricity. That it was an error Prof. Cobb conclusively proves. If, he says, the Sub-Committee had accepted as its work the comparison of electricity and other agents for the supply of power and other forms of energy, it would have done a great service. Had, however, they faithfully adopted this course (this is not said by the author), they would have destroyed much of the case for the project for the establishment of super-stations, equipped with steam turbines, and the appointment of Electricity Commissioners, with extensive powers.

Our readers are well acquainted with the inflated economies with which the Power Sub-Committee captured certain politicians, daily newspapers, and the public imagination. They neglected to say that it is easily capable of thermal proof that whatever economies can be effected in coal by electrical operation can be exceeded by other methods. Prof. Cobb brings out in the course of his argument the Sub-Committee estimates that the coal used in the production of power per annum in the United Kingdom is 80 million tons, valued at £40,000,000 at the pit head, which is a conclusion "stated with a degree of apparent confidence which does not seem to be justified by the method of its establishment." The Sub-Committee believes it feasible to reduce the coal required for power production from 5 lbs. per horse-power-hour to 1½ lbs., which would result in an annual saving of 56 million tons of coal. If the coal so saved were used for the production of further electrical power, it would be possible from the aggregate of 80 million tons to generate continuously throughout the year not less than 13,600,000 horse-power. These large economies, the Sub-Committee assumes, are to be secured through the convenience and efficiency of the electric-motor. The Sub-Committee desires to suppress by the collective method the individualistic method of supplying power. Prof. Cobb does not point out that many manufacturers require steam and hot-water for various purposes on their works, and that electrical generation then becomes something in the nature of a bye-product. To change-over to a central electrical power supply must give the manufacturer an economy in cost on his total requirement of steam, hot water, and electricity. But the author makes the point that "it must be realized that even now the total annual amount of coal used in the United Kingdom for the production of power through the medium of electricity is at most some 8 or 9 million tons, as against the estimated total of 80 million tons used for power purposes of all kinds." This indicates relatively small progress. There are other advantages put forward in the report; and the Committee's idea of the total value of the economies and advantages is £100,000,000. How they arrive at this figure is a mystery which Prof. Cobb does not attempt to probe.

However, it is clear that the Sub-Committee's generous estimate is based upon supplying all the needs of the community—"the economy of a combination of all requirements (power, traction, light, and heat) is fundamental." Our author finds the report rather obscure here; "but so far as it implies that the economical supply of power by the proposed central stations and distributing systems is dependent on the condition that they must play a prominent part in such matters as domestic and industrial heating, it is a damaging confession, for the proposed centralized system is particularly ill-adapted for these purposes." There are many other things in the report which Prof. Cobb believes are not likely to be taken for granted without full inquiry. However, what interests him more particularly is how far the claims of the Sub-Committee can be sustained in their contention that the methods they propose are, from the point of view of coal conservation, the best available for the public supply of power and other forms of energy. "What is involved is the very general question of the ultimate economy of electricity, generated and distributed from large central stations equipped with steam-turbines, as an agent for the supply of power, heat, and light when the source of the electrical energy is coal." We have it pointed out that, on the assumption that the coal consumption is reduced to 1½ lbs. per horse-power-hour, then from an average quality of coal (13,000 B.Th.U. per lb.) 19,500 B.Th.U. must be expended in order to supply 2544 B.Th.U. to the consumer—an efficiency of 13 p.ct., and a waste of 87 p.ct. On the other hand, the thermal efficiency of the gas-engine may be taken at 25 to 30 p.ct. Attention is here directed to the fact that while the steam-turbine is the best available power producer for large central stations, it is by no means an ideal for this purpose, and still less as the generator of all power. Rebellion against any such idea is evident in Mr. Talbot's useful notes upon "Fuel Economy in Modern Steel Works" (printed as an appendix to the Carbonization Sub-Committee's report) in which the large gas-engine is the prime mover favoured. If the developments indicated by Mr. Talbot, Prof. Bone, and the Carbonization Sub-Committee as necessary for the fuel economy of the steel industry are consummated, a central power station would no longer be able to lighten its generating costs by drawing upon waste heat to the extent that it can do to day.

Then in domestic heating no case has ever been made out, or is likely to be, for fuel economy by using electricity. The coal fire radiates, on a rough average, about 25 p.ct. of the total heat of the coal into the room—twice as much as the electrical current delivers. Then, if coal is carbonized as in gas-works practice, the process is effected with a thermal efficiency which reaches 80 p.ct. in good, and 70 p.ct. in average, practice. This means that for every 100 heat units in the original coal, after making allowance for the heating necessary to carbonize it, 70 units are still available in gas, coke, and tar, while useful chemicals are extracted at

* "Edinburgh Review," January. London: Longmans, Green, & Co. Price 6s. net.

the same time. The economic case for gas heating as opposed to electric heating is thus set out:

> When gas is put to use as a heating agent, there are none of the excessive losses we have had to take note of in the case of electricity. In a modern gas-fire, as has been amply demonstrated at the University of Leeds and elsewhere, about 50 p.ct. of the total heating value of the gas is radiated into the room, 25 p.ct. goes up the chimney, and the remainder heats the room and its contents by conduction and convection. Even the 25 p.ct. which goes up the chimney is not lost, since its ventilating effect is not only desirable but essential to health; and, if the fire is properly fitted, 10,000 c.ft. of air per hour can be moved through the room by this agency. A simple calculation will show that even taking the heat in the chimney gas as loss, the combined heat efficiency of the gas-works and the gas-fire is very approximately 50 p.ct., as against 13 p.ct. for the heat efficiency obtainable from electricity, even when the promised efficiency of the super-station is obtained. This is actually an understatement of the real case, since the electric-heater is here credited with an efficiency of 100 p ct., while it certainly does not radiate anything like that amount, and all calculations on that assumption neglect entirely the necessity for ventilation.

Light for general readers is next thrown by Prof. Cobb upon gas-works practice, and the past limitations imposed upon this practice by statutory standards. Due to the war there has been relaxation of the standards; "and there are reasons of paramount importance why they should not be reimposed." The realization of the highest thermal efficiency and maximum coal conservation would require that a larger proportion of the total heat should be obtained in the form of gas; and one of the most obvious and practicable methods of doing this is by the gasification of the coke. Information is given in the article as to the making of water gas; and its effect upon calorific power by the adoption of specified mixtures of coal gas and water gas. The process of steaming the charges in retorts is also touched upon. "Typical yields, not the most recent or the best, for steaming in vertical retorts may be averaged as 20,000 c.ft. of gas, 18 gallons of tar, and 30 lbs. of ammonium sulphate per ton of coal, as against 11,000 c ft., 10 gallons of tar, and 25 lbs. of ammonium sulphate for more normal practice in horizontal retorts." One more quotation:

> The immediate advantage to be derived by distributing some 50 p.ct. of the energy of the coal as gas can be readily estimated thus: The total domestic consumption of coal is estimated at 35 million tons per annum. If the whole of it were replaced by a gas carrying 50 p.ct. of the total heat energy of the coal, then, since gas is at least twice as efficient in use as raw coal, it would only be necessary to carbonize as a maximum the same quantity—35 million tons—of coal at the gas-works, instead of distributing it, while the residual coke would be available for replacing coal in other uses, thus effecting a real conservation of coal; and the light oil, fuel oil, and other chemicals would have been obtained in the most efficient manner known. On the other hand, even if electricity were 50 p.ct. more efficient in use than gas, the direct consumption of coal in boilers at the power station, with the maximum economy assumed in the report, would have to be 90 million tons per annum to do the same work, with no assets of coke or other bye-products more valuable than clinker. The amount of new plant required for the general gaseous heating system suggested may be gauged roughly from the datum that 15 million tons of coal is the estimated consumption at the gas-works of the country for 1913. The increase would be considerable, but in no sense formidable, as compared for example with the tenfold increase in capacity of existing electrical plant which would be necessary to take the domestic load alone.

Prof. Cobb next deals with the value of coal carbonization as a producer of chemical products, from which point of view it offers a striking and most welcome contrast to the burning of coal under boilers. But later on emphasis is placed on the fact that the strength of the gas industry and its commercial soundness are more peculiarly guaranteed by the presence of a large domestic market through which its primary product—gas—can be readily absorbed, and used in a highly economical manner.

We have here drawn attention in a cursory way, and to only a partial extent, to the contents of this keen criticism of the Power Sub-Committee's report. The value of the article [which occupied some twenty-three pages of the "Edinburgh Review"] for the public eye lies in its lucidity, and the happily conceived sequence of incontrovertible fact. There should also be sufficient in it to satisfy the Government and the Government Departments that they would do well, even now, to give time for more inquiry before proceeding with electrical schemes founded upon reports the hollowness of the contentions in which can be exposed, as Prof. Cobb has exposed them, with so much ease.

Temporary Increase of Charges Act.—Orders have been made by the Local Government Board, under the Statutory Undertakings (Temporary Increase of Charges) Act, in favour of the Bourne Urban District Council, increasing the maximum charge from 5s. 6d. to 7s. per 1000 c.ft., and of the Yeovil Corporation, with an increase from 4s. to 6s. per 1000 c.ft. The Board of Trade have made Orders under the Act in favour of the Penistone and District Gas Company and the Shrewsbury Gas Light Company; and they have received applications from the Bridgend (Glamorganshire) Gas and Water Company, the Bungay Gaslight and Coke Works, the Bushby and District Gas Company, the Fermoy Gas Company, Ltd., and the Wicklow District Gas Company.

BRITISH COMMERCIAL GAS ASSOCIATION.

Report of the Executive Committee.

In a report which the Executive Committee of the British Commercial Gas Association recently made to the General Committee, they state that, following upon the comprehensive publicity campaign inaugurated by the Association in connection with the Household Fuel and Lighting Order, and in view of the urgent need for increased activity on the part of the industry during the transition period from war to peace conditions, and especially in view of Government policy respecting the development and cheapening of the supply of electricity, a special effort was, and is being, made to secure the support of non-subscribing undertakings. Satisfactory results have so far been achieved; 45 additional subscribers having been secured since Sept. 1 last. The Association now have the support of fully 85 p.ct. of the industry, as measured by the sale of gas. The Committee feel that, in the critical times that confront the industry, unity of action and full financial support by every gas undertaking in the country are more than ever imperatively necessary; and they hope that the current financial year will see the income of the Association substantially increased, and the number of non-subscribers reduced to negligible proportions.

District Conferences.

It is felt that much can be done to reduce the list of non-subscribers by the holding of district conferences, at which the work of the Association can be made known more fully to the directorates and councils having control of the undertakings in each district. These conferences had to be suspended during the war; but the Committee recommend that they should be resumed in the spring and early summer of this year.

Gas v. Electricity for Fuel Purposes.

The results of the tests carried out in the autumn, at the instance of the Association, to demonstrate the truth or otherwise of the claims made by Mr. Belling as to the superiority of electricity over gas for cooking purposes have been published in the "Bulletin" and in the Technical Press; and have been given considerable publicity in the general Public Press. They have also been made the basis of protests sent from the National Gas Council to the Minister of Munitions and the Prime Minister respecting a report in the "Electrician" that, at a joint conference of employers and trade union advisory committees, Mr. Winston Churchill announced that the Government were prepared to place very large orders, if necessary, for (among other goods) electric lighting and cooking. Mr. Churchill replied that he had been only partially reported, as he had mentioned "ranges, stoves. . . . fittings for gas and electric cooking and lighting."

It may be added that the Association are co-operating fully with the National Gas Council in the preparation of the industry's case against preferential treatment of their competitors by the Government. It is hoped that before long the Association will have authoritative material at their disposal as a basis for active publicity, to make clear to the nation that the use of electricity as a heating agent is contrary alike to public policy and private interest.

Household Fuel and Lighting Order.

The recently announced increase of 25 p.ct. in the quantities of gas which consumers have been authorized to burn under the Household Fuel and Lighting Order will do something to relieve the situation of those undertakings whose output has been seriously diminished by the operation of the Order, and it is hoped foreshadows an early removal of all restrictions upon the sale of gas. The campaign conducted by the Association to bring home to consumers the possibility of taking gas in place of "tons of fuel" was much appreciated in all parts of the kingdom, and, as already mentioned, has served to secure several additional subscribers.

Children's Competitions.

In accordance with the Association's usual custom, a children's competition was announced in the pages of "Pear's Annual," and since in the educational journals. Owing to scarcity and high price of paper, it has not been found possible to present a book on this occasion; but a beautifully executed picture by Mr. H. M. Brock was prepared, and is being circulated in connection with the money prize-guessing competition arranged. A large number of inquiries have been received from children and teachers; and there is every prospect of previous successes in this connection being repeated, if not improved upon.

Housing Schemes.

Close attention has been given to this important item in the national programme of reconstruction. Conferences have been held with specialists and committees dealing with the subject; and a special memorandum giving details of gas equipment has been prepared and circulated. It is proposed to publish further special issues of "A Thousand-and-One Uses for Gas" dealing with the subject from many points of view, such as will appeal to the architect, builder, &c. In addition, articles by some of the leading experts on housing questions will be included in these numbers, and published in the professional journals.

The British Industrial "Safety First" Association.

In response to an invitation for donations to a fund to cover the expense incidental to the establishment and first year's working of this Association, the Executive recommend that the sum of £100 be voted for the purpose. They also recommend that the National Gas Council be asked to set-up a Special Committee to consider the best steps to be taken to secure "Safety First" (*a*) among those engaged in the manufacture and distribution of gas, and (*b*) among users of gas.

THE NATIONAL BENZOL ASSOCIATION.

NOTICE has been sent out by the Acting Secretary (Mr. P. G. Somerville) of a general meeting of the benzol industry, to be held in the Council Chamber, Caxton Hall, Westminster, on Tuesday, Feb. 11, at 2.30.

With the notice is enclosed a copy of the revised constitution and rules and a membership form for the Association, from which it is seen that it has been decided to include producers of crude benzol as members. In the "JOURNAL" for Dec. 10 [p. 566], there was given a summary of the provisional constitution and rules; but in view of the alterations that have since been made, it will be better to treat the revised rules (of which there are 31) quite apart from anything that was published then.

Revised Constitution and Rules.

Provision is made for an annual general meeting; and special meetings may be called under conditions indicated. The voting powers and method of election of officers are defined. The Association is to be managed by an Executive Committee, who may delegate powers to Sub-Committees. Members of the Executive retire each year, but may be re-elected. The Committee may appoint and pay a manager and secretary and other officials. Wherever the word "benzol" is used without qualification, it includes crude benzol, refined benzol, and its homologues.

OBJECTS OF THE ASSOCIATION.

4.—The objects of the Association are:
(*a*) To consolidate and further the interests of producers of crude and refined benzol and its homologues.
(*b*) To standardize benzol for motor spirit.
(*c*) To carry on, assist, and promote investigation and research with a view to improving the suitability of benzol for that or any other purpose.
(*d*) To purchase, take on lease, or otherwise acquire, and to maintain and dispose of any property for the purposes of the Association.
(*e*) To borrow money within the limits from time to time authorized by the subscribers at a general meeting.
(*f*) To establish branch offices in any part of Great Britain or abroad.
(*g*) To promote a limited company or companies, so far as may be considered necessary or desirable, for the furtherance of all or any of the objects of the Association.
(*h*) To promote and protect the interests of members in all matters relating to the objects of the Association, including taxation and legislation, and to take such legal and parliamentary action as may be necessary therefor.
(*i*) To combine or co-operate with any society, organization, association, or company having objects wholly or in part similar to those of the Association.
(*j*) To do all other lawful things incidental or conducive to the attainment of the objects of the Association.

5.—The Association shall consist of producers of crude and refined benzol whose businesses are situated in the British Isles, and who are subscribers to the Association, and who have signed a statement agreeing to become members of the Association and to be bound by the rules of the Association.

SUBSCRIPTIONS.

6.—The annual subscription of each member shall be as follows:
(*a*) For crude producers who are not refiners, 1s. per 1000 gallons annual production of crude.
(*b*) For producer refiners, 2s. per 1000 gallons annual production of refined benzol and its homologues.
(*c*) For refiners purchasing the whole or part of their crude benzol, 1s. per 1000 gallons annual production of refined products from such bought material. For their own production, 2s. per 1000 gallons annual production.

The liability of each subscriber shall be limited to the amount of his subscription.

7.—Subscriptions shall be paid half yearly on March 1 and Sept. 1 of each year, based upon production for the six months to Dec. 31 and June 30 preceding. The first subscription shall be payable on March 1, 1919, based on the production for the half year ended Dec. 31, 1918.

8.—A subscriber shall give six months' notice, expiring on June 30 in any year, of his desire to retire from the Association.

THE EXECUTIVE COMMITTEE.

15.—The Executive Committee shall consist of not more than twenty members, representing the following districts:

(1) Scotland.
(2) Cumberland and Northumberland.
(3) Lancashire, Cheshire, and North Wales.
(4) North-Eastern, including Durham and the North Riding of York.
(5) East and West Riding of York., Derbyshire, North Staffordshire, and Notts.
(6) Birmingham, including all the Midland area not included in (5) and (7).
(7) London and the Southern Counties.
(8) West of England and South Wales.

The first Executive Committee shall consist of two representatives for each district, except in the cases of Districts (4) and (5), which shall have three representatives each.

16.—The Executive Committee shall have power to co-opt any additional member or members to serve on the Committee.

SALE OF BENZOL.

21.—Pending arrangements being made for the sale and distribution of benzol, the Association shall from time to time advise members as to selling prices.

22.—Members shall abide by the scale of prices issued by the Association; and no member shall take a lower price than the current schedule without first reporting the matter to the Executive Committee and obtaining the sanction of that Committee.

BENZOL RETURNS.

29.—Each member of the Association shall, when requested by the Executive Committee to do so, make a return of the quantity of benzol dealt with at his works during any stated period, and supply such other information relating to such benzol as the Executive Committee may require for the purposes of the Association.

ELECTRICITY SUPPLY MEMORANDA.

THE symptoms which we have in the electrical papers week by week of a very earnest desire on the part of the municipal owners of electricity concerns to extend them—in some cases on gigantic lines—despite the wish of the Government to reform, reorganize, co-ordinate, concentrate, and so forth, the whole of the generating systems of the country, have been the subject of notice recently in the "Memoranda." The same anxiety to equip at once outside the Government plans has since been observed. What we have seen has been remarked by the Board of Trade, who, we rather think, are somewhat alarmed over the course things are taking. But it is not possible to dam a river, and cause a deviation, without making due preparation. An indication of the feeling of the Board is found in a letter which they have addressed to the London County Council. Naturally, the latter body knows all about the report of the Electric Power Supply Committee, and the recommendation as to the appointment of Electricity Commissioners to organize and supervise the electric supply of the country. The Board, however, in the letter remind the Council of these things. They also tell them something which no doubt Spring Gardens previously appreciated, that the Board are aware that many stations are overloaded, and that urgent developments have been held-up during the war. Therefore the Board, with a keenness of perception which does them great credit, anticipate that many proposals will be made for the extension of generating plant throughout the country. The Board want to keep control over any expenditure in this direction. They have therefore appointed Sir John Snell as adviser on all matters arising out of the report, and to institute preliminary investigations. The Board express the opinion that, so far as is possible, any extensions of plant should only be allowed if they can be shown not to conflict with the contemplated larger schemes. What puzzles us is who can yet tell whether or not they will conflict, seeing that the work of co-ordination and development is to be left to the District Boards working under the Electricity Commissioners. However, the Council are the electricity loan-sanctioning authority for London; and so the Board have asked the Council, before they entertain any application for a loan for electricity purposes, to refer it to the Board, in order that it may be examined from the point of view of whether or not the proposed work will clash with the larger embryonic schemes. The Council are willing to do so, as far as applications refer to generating plant; but they do not declare any willingness to abide by any decision of the Board. All they are prepared to do, in safeguarding their position as the loan-sanctioning authority, is to forward the applications for the Board's observations from the electricity, as distinct from the financial, point of view. Already such loan applications are considered, by a Special Committee on London Electricity Supply, from the standpoint of electricity supply generally. With all this surveillance over loans, it should not be possible for anything to be done that is repugnant to future electrical development in London. While the Board of Trade are waiting for further loan applications, they might devote the spare time to a study of Prof. Cobb's article in the current issue of the "Edinburgh Review," which is noticed elsewhere in this number of the "JOURNAL."

Present Loans and the Super Scheme.

"National Importance" Limited to Power Supply.

The Daily Press has been leading people to believe that the Government electrical schemes mean a prompt and cheap supply of electricity for everybody who desires it. The Government has only got to issue the command; and as soon as the works are constructed, the thing is done. There are a good many boobies in the world; and some of the stuff, labelled "popular," which is served up in the daily papers shows that the class of individual referred to has representatives in the journalistic world. The "Electrical Review" is getting frightened, as well it might. It fears that the public will begin to expect too much. Of course, the "Review" knows how, under the best of conditions, it has been ordained that the electrical generating system with coal at the base of operations shall show poor thermal efficiency, and that the hope of substantially bettering this is very remote; also that the big schemes in prospect are "dark horses" in respect of costs delivered, and in other ways. Our contemporary does not therefore, in the kindness of its heart, want the public to be misled; and

this anxiety is evidence of a feeling that the schemes are not likely to influence directly any great cheapening of electrical energy for domestic purposes. It points out that the "national importance of the scheme is limited to its industrial aspect." The justifying principle upon which alone the Board of Trade Committee put forward the scheme is, it adds, that there should be available a supply of cheap power adequate for the expansion of existing industries, and for the encouragement of industries altogether new. While industrial service is the main purpose, we are not altogether sure that the Committee did take the limited view as to "national importance." Paragraphs 4 and 5 of their report carry the side-heading "National Aspects;" and these, among other passages, we read: "The extent to which electricity may be further applied to cheaper and better mechanical production, to improved railway service, to electro-chemical and metallurgical processes, to agriculture, and to *domestic-labour saving apparatus* is altogether incalculable." Then, further, "great advantage will accrue to the *whole community* from the changes which we recommend." These quotations do not put upon the "National Importance" of the schemes quite the limits suggested by the "Review." The Coal Conservation Power Sub-Committee of the Ministry of Reconstruction approached the matter from the standpoint of coal conservation; and a bad case, Prof. Cobb has shown in the article incidentally referred to above, they made out for electricity when one gets beneath the specious superficiality of their report. The Power Committee of the Board of Trade dealt with power, and left coal conservation largely out of sight. But they treated of power as though it should be nothing but the electrical brand. This is not looking at the matter with national broadness. To deal with it from the national point of view, coal conservation and all power agents should have been brought under survey.

Competition and One-Sided State Support.

However, later on, the "Review" asserts that the Board of Trade Committee wisely included domestic users only as of secondary and subordinate consideration. Our contemporary wants it to be clearly borne in mind that the Board of Trade Committee did not propose any State finance or support to the end that private householders should have cheap electric cooking, heating, vacuum cleaning, and so forth, none of which, however desirable, can (it says) be claimed as of national consequence in the same sense as cheap and universal power. Knowing what we do as to the thermal inefficiency of the electrical process, we do not suppose for an instant that "cheap" electric cooking or heating has any real part in the scheme. But, seeing that the intention is for the District Boards to take over the whole of the generating plants, and to be solely responsible for generation, transmission, and supply to the cables of the distributors in the cities and towns, we cannot for the life of us see how the energy used for cooking, heating, and other domestic purposes can escape all association with State finance and support. Therefore, the proposal is that the Government shall financially support—indirectly it may be—the electricity industry's competition with other agents for light, heat, and power. On what grounds? The "Review," of course, wants to avoid this aspect of the case; or, rather, it would like to be able to show that it has no actual existence. It has existence; and it must improve in some measure the position of electricity in the competition compared with its present position. The Government has no right to interfere in any way with ordinary commercial trading and competition, What a howl of indignation would go up from the electrical industry if the Government, in recognition of the war time services of the gas industry, bestowed upon it preferential financial and other support! However, the "Review" follows up its argument as follows: "In fact, if the Board of Trade had committed itself to the proposition that it was so necessary that the country should use electric cooking and electric heating that even State aid should be invoked for that purpose, it would have landed itself in the dilemma that it was catering either for the luxury of the few or for the necessities of everyone—the latter case leading to the inference that the Government considered it of pressing national importance that every gas stove and gas cooker should be scrapped at the earliest possible moment." It would be a bad day for the country if the Government showed any such absolute qualification for the tenancy of a lunatic asylum.

Breakdowns.

There have been several failures of electric supply lately; and, while some have been due to the overloading of deteriorated plant, it cannot be said that the whole of them are traceable to this cause. Without going farther back than the past two or three weeks, there have been recorded a failure at Dublin, which affected the central area, causing considerable inconvenience, and the closing-down of picture palaces. At Manchester an underground explosion in Albert Street temporarily cut off the supply to the district, damaging an electric cable, and severing some 600 telephone wires. Kingston-on-Thames (this is due to plant deficiencies) has had repeated trouble with cessation of the electric current. The Ardee Board of Guardians have found that, in respect of cost and reliability, their workhouse has not been so well off since its lighting has been by current taken off the town mains. On one occasion the light failed when an operation was proceeding in the workhouse hospital. The Guardians have been discussing the question of returning to gas or installing a private generating plant. On Monday night last week, there was in London a stoppage of the traffic on the District Railway owing to an electrical breakdown. There have no doubt been during the same brief period a number of unrecorded stoppages of supply; but the known ones show that electrical systems have not yet put themselves beyond reproach in this respect.

A Great Ideal.

In his final Chadwick Lecture at the Society of Arts, Mr. A. H. Barker spoke of the ideal of general electricity supply at a farthing per unit. This ideal is very far off realization. It would be so under the old normal conditions in regard to fuel, capital, distribution, and general working expenses. But under the ruling and the certain continued higher costs for everything, the prospect of the ideal being attained is not cheering. Moreover, the Power Sub-Committee of the Coal Conservation Committee could not give any hope of a higher efficiency than 13 p.ct. from the coal consumed for electricity generation, which is a bad look-out for the general application of electricity to domestic heating purposes of any kind. Still Mr. Barker believes, if the great ideal of a farthing per unit could be realized, that electricity would be sufficiently economical to make it well worth general adoption for cooking, to a certain extent for heating, and to a much smaller extent for hot-water supply—not on account of its financial economy, but on account of the extreme convenience with which it can be manipulated. Gas undertakings that have had the work thrust upon them of displacing electric cooking and heating appliances have heard from householders a good deal about the alleged convenience. However, after what Mr. Barker says, electrical men may possibly be encouraged to set out on a quest for the materialization of the "great ideal." It is further noted that in this lecture Mr. Barker severely criticized, on the score of extravagance, the equipment which has been supplied to some of the National Kitchens. Also from his analysis of the advantages and disadvantages of a supply of hot water and heating power from a central station, he concludes that the proposal is not economically sound. This is an opinion that is held by many besides Mr. Barker.

ENGINEERING TRADES COMMITTEE.

Report on New Industries.

A REPORT has been issued by the Ministry of Reconstruction, of the Engineering Trades (New Industries) Committee, who were appointed at the end of 1917 to compile a list of the articles suitable for manufacture by those with engineering trade experience or plant which were either not made in the United Kingdom before the war, but were imported, or were made in the United Kingdom in small or insufficient quantities, and for which there is likely to be a considerable demand after the war. The articles were to classified as to whether they are capable of being made by women, men and women, or skilled men; and the industries were to be set out to which such new manufactures would be most suitably attached. The Committee were also to make recommendations with regard to the necessary transfer of labour, machines, &c. For the purpose of the inquiry, a number of Branch Committees were appointed.

Before setting-out the list of articles which they have compiled in accordance with their reference, the Committee express the opinion that in many branches of the engineering trades there exist fresh openings for British enterprise; but it is evident to them that questions of finance will have an importment bearing on the ability of engineering firms after the war to embark on new industries, or to develop those already existing. Extensions of plant on war work have not only exhausted the working capital of firms concerned, but have in many cases also absorbed the excess profits earned and not yet paid into the Treasury. Accordingly, the Committee think that many engineering firms in this country are threatened with serious financial trouble unless some steps are promptly taken to finance payments due by engineering firms to the Inland Revenue. As a matter of fact, it is understood that certain Government Departments have been compelled to make arrangements for loans to firms who have contracts in hand for them to enable the firms to meet the urgent demands made upon them by the Inland Revenue. It is assumed confidently by the Committee that the excess profis tax will be removed as soon as possible. If it were not so removed, they remark, there would be small likelihood of firms undertaking the risks inseparable from the starting of new industries in this country. Indications point to difficulties of raising capital by means of new issues.

Emphasis is laid on the fact that in some branches of the engineering trades the industry has not kept pace with the requirements of their customers; and they suggest as the principal remedies specialization and standardization, particularly in the case of small manufacturers who, in their opinion, would do better to confine themselves to the manufacture of a few types of articles which they could then bring to greater perfection, and produce more cheaply. Such a concentration by each manufacturer on a few types of articles with proper standardization would enable engineering operations to be carried out as repetition work; and this would not only enable many highly skilled and highly paid men to be engaged, but would also create an opening for the employment at good wages of a number of unskilled and semi-skilled operatives, male and female, and wounded soldiers.

From the Branch Committees' reports, the two following extracts are taken :

LARGE POWER GAS-ENGINES.

At the commencement of the war, the horizontal large power gas-engines, of about 1800 to 2000 H.P., at work in this country were principally of foreign manufacture; and only a few British firms made them. In addition to the horizontal large power gas-engine, there has been developed in this country the manufacture of a vertical type of multiple cylinder engine giving powers up to 1500 H.P. on blast-furnace gas, producer gas, or coke-oven gas. British manufacturers are successfully engaged in the production of both these classes of large power gas-engines; and it is understood that one very large firm has, since the war, also taken up their manufacture. There is, however, considerable room for further development of the large power gas-engines, particularly as the great extensions now in progress, and contemplated, by iron smelters and steel manufacturers, with a consequent development of coke-oven plants at collieries, will naturally produce as bye-products large quantities of blast-furnace and coke-oven gas. The Branch Committee are of opinion that, generally speaking, firms already engaged in the manufacture of these engines are in a position to meet the requirements of this country.

GAS-MANTLE YARNS OR RAMIE FIBRE MACHINERY.

In the making of special machinery for the production of ramie yarns for gas-mantles, this country has been many years behind Germany, and until quite recently has been hopelessly outclassed both in quality and design of machines and in the finished production from these machines. More than twenty years ago, one or two English firms made attempts at spinning satisfactory ramie yarns on the usual types of worsted spinning machinery, but with little success. A full set of the German type of ramie machinery was then purchased and brought into this country; so that to-day English textile machine makers have a full range of the German models, and can make a complete installation of the latest and most up-to-date machinery for the production of gas-mantle yarns.

The Committee have agreed that bona-fide inquirers interested in the manufacture in Britain of any particular article may be put in touch with the Chairman of the Branch Committee concerned to obtain such information as is available, and advise as to their prospects in entering upon a new field of industry. Such inquirers will be able to obtain at the Ministry of Reconstruction all information made available by Branch Committees, except that of a confidential nature.

SIXTY YEARS AGO.

[From the "Journal" for January, 1859.]

Interference.—The events of the past year in which the interests of gas companies are concerned present a chequered picture of light and shade; but in the general aspect brightness greatly predominates over gloom. So far, indeed, as regards the essential point of consumption, everything appears cheering and full of promise; and we may congratulate all established companies on the increase of their rentals, accompanied in most cases by increase of dividends—the latter result having been materially aided by the low prices of coals and, with a few exceptions, by the fair prices obtained for residual products. As regards the demand for gas, therefore, and the profits realized by the extension of gas illumination, the prospect is fair and encouraging. The shaded parts of the picture are produced almost exclusively by the interference of parliamentary and other authorities with the natural course of commercial operations, from which interference gas companies continue to be annoyed, and their business to be impeded, in a more vexatious manner than any other manufacturing interest.

Mr. Flintoff and Dublin.—Not deterred by the exposure of the four-shilling gas delusion in London, Mr. George Flintoff has re-appeared on the scene in Dublin, to set afloat the still more impracticable project of lighting that city with gas at 3s. 6d. per 1000 c.ft. The "Dublin Independent Consumers' Company," under Mr. Flintoff's management, are to do wonders, as appears from a report wherein the plan is fully expounded. Mr. Clegg, Mr. T. A. Hedley, and Sir John Macneill are the authorities quoted as sanctioning the supply of 14-candle gas to private consumers in Dublin for 3s. 6d., and the lighting of the public lamps for 2s. 6d. per 1000 c.ft.; and Mr. Flintoff further promises the shareholders, after paying them dividends of 10 p.ct., to reduce the price to 3s. As a specimen of the data on which he founds his calculations, it may be sufficient to mention that he starts with the reputed proposition that the price of coal has nothing to do with the price of gas; for by selling the coke at 10s. a chaldron, and the tar at 1s. a gallon, the cost price of materials for making 1000 c.ft. of gas was shown to be only 4d. Whether in the progress of science, which Mr. Flintoff talks about, he has discovered the means of distilling coal without fuel, does not appear; but he made no allowance for fuel in his estimates. By proceeding on such a plan, it would not be difficult for less clever men than Mr. Flintoff to concoct schemes for lighting the Irish Metropolis on still lower terms. If there be any person in Dublin inclined to believe the glowing representations with which it is intended to induce them to take shares, we strongly recommend such individuals to compare the evidence given before Parliament in support of the Great Central Gas Consumers' Company with the evidence given before the arbitrators on Mr. Croll's claims after the real value of the estimates and representations in support of four-shilling gas in London had been tested by sad experience.

AMERICAN GAS ASSOCIATION.

The Executive Board of the American Gas Association have been busy planning a Reconstruction Conference, at which members of the Executive Board, committees, and delegates of company members will give definite expression to the policies of the various interests in the industry. It is intended to hold the conference during February; and while no formal papers will be submitted, there will be addresses by prominent gas men on topical matters, which will be followed by informal discussion. The first annual convention and exhibition of the Association will take place next autumn; but the Executive Board have made other arrangements also for maintaining the members in close touch with affairs. There will be issued from time to time bulletins concerning matters of special interest; these being in addition to the "American Gas Association Monthly"—a magazine which will have for its aim to keep members apprised of all Association activities and progress, and at the same time to offer them constructive suggestions and authoritative opinions that may be of real value to them and to their business. Mr. W. A. Ehlers has resumed his connection with the Association; and there is in contemplation an extension of the industrial fuel service work that was formerly carried on by him under the auspices of the National Commercial Gas Association. At Nov. 15 last, the number of individual members of the American Gas Association was 1300, which is 16¼ p.ct. of the total membership in 29 American gas societies. There were also 275 company members, which is 25 p.ct. of the total number of artificial gas companies in the United States. These companies do a yearly gas business of $150,000,000, or 60 p.ct. of the total gas business of the country (estimated at $250,000,000 for 1918). The manufacturing company members at the same date numbered 78; and these companies do an annual business in gas appliances amounting to over $25,000,000. The total annual income of the Association from the membership is approximately $64,000; but there will also be available additional revenue with which to carry on activities suggested and approved from time to time.

The "Joyner" Gas-Controller.

Just prior to the outbreak of war, a patent pressure-wave gas-controller was perfected by Messrs. Charles Joyner & Co., Ltd., of Icknield Square, Birmingham, for which are claimed extreme simplicity, and the fact that all valves, cog-wheels, rotary spindles, gears, and, indeed, "everything that has hitherto constituted a gas-controller," have been dispensed with. War-time restrictions, of course, have hitherto greatly interfered with the introduction of the device; but, with the removal of these, the desire should be greater than it has ever been before for the automatic lighting and extinguishing of street-lamps. The "Joyner" controller consists of a float, to which gas is admitted, immersed in a mercury bath. Depending from the under surface of the float is a bell immersed in a second mercury bath, which acts as a seal to the gas-way to the burner. When the float is raised by a pressure-wave, the bell is withdrawn from its mercury bath, and the gas has free and unobstructed passage to the burner. Thus, instead of utilizing the lifting action of the float simply as the motive power to operate some form of rotary valve, the float itself is made to act as a valve. On the upper surface of the float is fixed a swinging lever, having its upper end bent at right angles to form a hook or arm, and weighted at its lower extremity so that it always has a tendency to return to a vertical position. Above this a wedge-shaped piece is fixed. When the float is in the lowered, or "off" position, the upper end of the swinging lever is at rest against a stop; but when the float rises in response to a pressure-wave, the lever engages the lower surface of the wedge-shaped piece, and slides along it until it swings over and rests against a gate until the pressure returns to normal. It then falls into a notch, when the float is suspended, with the gas "on." With the application of a second pressure wave, the lever again rises and rests against the gate until the pressure is reduced, when it slides down and comes to rest again, ready for the operation to be repeated. A slight modification is required when a three-wave cycle is employed with the object of extinguishing a portion of the lights. The gas has no access to the upper side of the float, and so does not come into contact with the swinging lever—the only part which it might injuriously affect. The controller can be completely dismantled without removing the burner; and the moving parts can be inspected in action by removing a cap. The appliance is small in size (owing to the method of carrying the lead weights required for the adjustment of pressure), and is extremely sensitive; while the material used in construction is entirely unaffected by the action of mercury or moisture.

"Gas and Gas Making."—There has been received from Messrs. Sir Isaac Pitman & Sons, Ltd., of No. 1, Amen Corner, E.C., and will be reviewed in due course, a copy of "Gas and Gas Making" (by Mr. W. H. Y. Webber), the published price of which is 2s. 6d. net. It is one of Pitman's "Common Commodities and Industries" Series, and deals with the growth, methods, and the prospects of the gas industry. The text is accompanied by a number of illustrations.

INSTITUTION GAS INVESTIGATION COMMITTEE.

Reply of the Research Sub-Committee to Comments made at the Meeting ast October.

IT will be remembered that at the conclusion of the long discussion at the special meeting last October of the Institution of Gas Engineers, on the first report of the Research Sub-Committee appointed by the Gas Investigation Committee of the Institution it was arranged by the President (Mr. Samuel Glover) that a reply should be submitted in writing. This reply the Sub-Committee have now prepared, prefacing their remarks with acknowledgments to Lord Moulton, Sir George Beilby, Sir Dugald Clerk, and others, for their testimony to the usefulness of the work done. It seems to the Sub-Committee to be advisable, in reply to criticisms made, to state again in unmistakable terms what they set out to do. It is, they say, also necessary to call attention to the warning issued by Prof. Smithells, as to the danger of premature deduction from the published results of an investigation which, although they believe it to be entirely trustworthy in the ground that it covers, is professedly incomplete. In connection with the Sub-Committee's reply given below, readers may be referred to their report, which appeared in the "JOURNAL" for Oct. 29 [p. 235], and the discussion, which was given on Nov. 5 [p. 291].

CRITICISMS OF TESTS.

An investigation which has for its object the comparison in use of different grades of gas, and particularly one which aims at providing reliable information on the subject of new standards, must obviously take into full account in the first instance the comparative efficiencies in the appliances of to-day. To suggest that the tests should have been made on the inverted instead of the upright incandescent mantle because the former was likely to prove more efficient, seems to miss the point of the investigation. It was plain from the beginning that both must be tested; and it was clearly stated in the report that tests on the inverted mantle were in the normal course which the investigation must follow. It is surely realized that the public interest, the information of the gas industry, and the correction if need be of ill-founded statements, all demand that we should be able to speak on the basis of results obtained from both types of burner, and from the one as compared with the other.

When we have completed the first portion of our work, it is our intention (already expressed) to study the possibility of increasing the efficiencies beyond the normal of to-day, by the use of such modified appliances as may be suggested. But the limitation of our time and resources necessitates the postponement of this part of our work (which may attain considerable dimensions) until the first part has been carried out. It is then that the recognition at our hands of improvement and invention in gas appliances may be reasonably expected, since we share completely the view that the future of the industry cannot be cramped by an exclusive regard to existing appliances either for use or production.

There is more to be said for the criticism of certain tests being made upon a gas-fire of low radiant efficiency. But the initial choice of a fire was determined by a number of considerations, which it is perhaps unnecessary to go into now; and the results had such considerable comparative value that, having regard to necessary economy in time, we felt justified in using them.

In view of comments made by several speakers, it is well to repeat what has already been said—that we have as yet made no recommendation whatever as to standards. The only result which can be quoted in support of any such view is that, in the particular upright incandescent burner which we tested, there was a falling-off in the candle power for the same B.Th.U. with gas of a lower calorific value than 525 B.Th.U. gross per c.ft. This statement is in no way equivalent to saying that full illumination cannot be obtained with a gas of lower grade.

It is necessary that a careful and comprehensive survey of recent developments of various kinds, and of all-round efficiency and economy in production, distribution, and use, must be made before the Gas Investigation Committee is able to form a reasoned and final opinion on what standard it ought to recommend. With reference to the statements that some of our results add nothing to existing knowledge, it cannot be too well understood that the Committee will welcome warmly information which can be brought to its notice of other experiments made upon the same lines, particularly if the data have the necessary degree of precision.

GAS-RINGS.

The idea is prevalent that it would have been more satisfactory in testing ring-burners to have taken some typical hot-plate, and to have used it with the different grades of gas without alteration or adjustment, instead of following the course adopted by the Research Sub-Committee. Such a plan would have given information of very little value to the industry, and less to the investigation. While the essential principles are the same, there is considerable difference in detail of design in existing hot-plates and their burners; and in endeavours to secure simplicity of construction and ease of cleaning and assembly of parts, adjustments to be made by the consumer have been reduced by the makers to a minimum. Provided the burners are properly adjusted to suit local conditions, and uniformity of gas quality is maintained, little objection can be made to this plan. Such burners are not, however, capable of dealing equally efficiently with gas which is seriously richer or poorer than that for which they are adjusted.

There is not the slightest doubt that, had the same hot-plate burner (adjusted correctly for 500 B.Th.U. net gas) been used without alteration for all tests, under reasonable and strictly comparable conditions, the efficiency would have fallen appreciably as the calorific value was reduced. It would be easy to ascribe this directly to the reduction in calorific value, whereas the evidence in the report shows beyond dispute that it is mainly due to the lack of flame contact. Further tests upon the lines already adopted would have been the inevitable sequel.

Too much has been made of varying the distance between the burner and the vessel as being an adjustment not within the reach of the consumer. Not only has the present to be considered, but it was desirable that tests should be carried out which should indicate the best conditions, with the burner in use, for each different grade of gas, and to indicate also the lines upon which improvements may be reasonably looked for. Especially is this the case when existing hot-plate burners or slight modifications of them must represent the majority of such appliances for some considerable time to come.

More might be said as to the manner of support adopted for the vessel. The bearers in hot-plates are made of wrought or cast iron, with considerable diversity in size, weight, and pattern, so that the flames are distorted and ventilation is interfered with to a greater or less extent, and an uncertain amount of heat is dissipated by conduction to the bearers and framework. It was with the idea of eliminating an unknown quantity, likely to produce disturbing secondary effects, that the bearers were removed, rather than that of obtaining an artificially high efficiency.

Protest must be made against the practice of testing hot-plate burners when turned "full on," as representing the best performance that consumers can obtain. It is not necessarily or usually so. Broadly speaking, the amount of heat transmitted through a metallic partition depends upon the mean temperature difference between the two sides, the thickness and nature of the metal, the cleanliness or otherwise of its surfaces, upon the time of heating, and upon the area exposed to the source of heat. In other words, a given vessel under stipulated conditions of use is capable of transmitting a certain limited number of B.Th.U. per hour to its contents. No matter how efficient the burner may be as regards heat production, if the rate of heat supply exceeds the rate of heat transmission (*plus* sufficient heat to make good certain well-known and unavoidable losses due to radiation, loss of sensible heat of products of combustion, &c.), the excess will be lost, with a corresponding loss of efficiency.

The area of base of the average nominal quart kettle is about half that of the kettle used for our tests; and even with a copper kettle, a rate of heat supply of 10,000 B.Th.U. per hour is probably excessive with the quart kettle. Sufficient attention is not usually given to this point, especially with small vessels, with the result that very low efficiencies are reported from time to time. In this respect we agree with the contention that the burner and vessel should be reasonably proportioned to one another; and we believe that in our tests this has been done. Careless consumers, by the use of a burner too large for the vessel to be heated, or by an excessive supply of gas to an otherwise suitable burner, cause flames to pass beyond the base of the vessel. While the actual speed of heating may be increased to a certain point by this means, the efficiency upon B.Th.U. supplied invariably falls.

While admitting that the foregoing conditions represent practical usage in many cases, they show an unfortunate disregard of the conditions essential to economy; and it would be unwise to adhere to them in an efficiency investigation merely because they represent (bad) practice. On actual cooker hot-plates results have been obtained only slightly inferior to those given in the report; and while efficiencies of 20 to 25 p.ct. are not uncommon, their lowness is due to easily avoidable causes. Education of the consumer as to the correct method of using what is supplied to him must always be a matter of importance.

LIGHTING.

The values for candles per cubic foot obtained with the upright incandescent burner have caused considerable comment. In the first place, the figures commonly quoted are for the pre-war 16 to 17 candle gas, of (say) 600 B.Th.U. gross, 540 net, per cubic foot. Assuming for the moment equal thermal efficiency for all grades of gas (*i.e.*, B.Th.U. consumed per candle-hour the same throughout), the candles per cubic foot would fall in proportion to the calorific value—*i.e.*, the equivalent of 20 candles per cubic foot

with 600 B.Th.U. gas would be 16·7 with 500 B.Th.U. gas, 13·3 with 400 B.Th.U. gas, and 10·0 candles per cubic foot with 300 B.Th.U. gas.

In the second place, a very popular and widely used burner was employed; and the comparative results obtained with it were reported because they were the only figures available at the time we issued the report, and the need for further investigation was quite realized and stated. The use in a further series of tests of another equally representative and widely used burner has given higher efficieneies; and the limiting values as regards calorific value are somewhat different. The well-founded claims of high-pressure gas on the score of efficiency are, of course, admitted; but owing to its relatively restricted use in domestic practice, it has not as yet been investigated.

At the meeting in London on Oct. 17, certain photographs were exhibited. While expressing appreciation of an attempt to produce a visual record of results obtained, it must be pointed out that the method adopted is unreliable, and was rejected by the Research Sub-Committee after careful consideration some months ago. [See note in column two.]

It has seemed satisfactory to some to burn different grades of gas in burners side by side, and to declare that the results were "the same," "equal," or "similar." Those familiar with photometric testing know that a glance at a 10 candle-power pentane lamp, or an incandescent mantle under test, produces such an effect upon the eye, rendering it less sensitive to differences in shades of light, as to make it impossible to continue the test five or ten minutes, or longer. The eye judges mainly intrinsic brilliancy, and not total illumination; and, taken in conjunction with fatigue of the retina, it is possible to err by 20 p.ct. in comparing two sources of light of 70 to 100 candle-power each. Quite hopeless is the position of those who compare the results obtained with a particular gas with that of a memorized impression only of the same burner burning with a different quality of gas previously under trial.

GAS-FIRES.

Some complaint has been made that by quoting the radiant efficiency only in the case of the gas-fire, due credit is not given to the fire for its total efficiency as a heating agent. This is true. The investigation, however, is for the present mainly concerned with variations in efficiency in use of different grades of gas; and the radiant efficiency is the property likely to suffer the greatest variation (if any), and hence forms a convenient index to the behaviour of the gases. If the radiant efficiency remains constant, it is unlikely that either the convected heat or flue losses will suffer serious alteration with a particular appliance. Further, the experimental work is considerably lightened, and much time can be saved, if the radiant efficiency only is measured. From the point of view of the investigation, the practice is quite justified.

MISCELLANEOUS.

Attention has been called to discrepancies between calorific values as determined by the calorimeter and those calculated from the gas analyses given in the report. From the outset, this has been known; and after due consideration, the determined calorific values were decided to be the more reliable. Emphatic notes to the effect that the results are all based upon the determined calorific values will be found in the report. As the investigation continues, the correctness of this decision is supported.

J. H. Coste, in his "Calorific Power of Gases," discusses at length the sources of error in calorimetric testing; and Norton H. Humphrys* suggests causes for the discrepancies. It would take up too much space to discuss in detail the precise arrangement of apparatus employed by the Research Chemist; but it is not always realized that the relative disposition of appliances tested, gasholder, sampling tube, and calorimeter, as well as the rate of working, can seriously affect results, and that certain precautions and corrections usually regarded as "academic" must be carefully applied. The difficulty of obtaining exact concordance is so great, and the probability of the direct calorimetric determination being the more accurate is so overwhelming, that the figure so determined has been made the basis of our comparison throughout.

Some disappointment has been felt at the omission from the report of mixtures of coal gas and blue water-gas, each with low inerts. This is entirely a question of time, and not of oversight; and the omission has since been remedied. With regard to the very high percentage of inerts in some of the mixtures, it should be remembered that one of the objects of the investigation was to study the effects of inerts in considerable quantity upon efficiency. One statement made—that the report "shows beyond dispute that gas around 500 B.Th.U. cannot be obtained unmixed with a large percentage of inert constituents"—must be emphatically contradicted. Such a statement is quite unfounded in fact; nor can it be inferred or deduced from any information in the report.

It is with regret that we note that the conclusions in connection with the incandescent mantle have been taken to mean that flame temperature is a matter of little importance. It may be that gases of higher calculated flame temperatures will prove more efficient than those with lower flame temperatures; but actual conditions of use are such that, owing to imperfect contact between the flame and the body to be heated (mantle), the advantages of the superior flame temperature may be entirely nullified. Flame temperature has been proposed as a basis of comparison for the different grades of gas. It has already been pointed out by Prof. Smithells, Prof. Cobb, Mr. E. W. Smith, D.Sc., and others, that flame temperature is a conception easily grasped, but that its determination is a matter of extreme difficulty.

* "Gas World," Vol. LXIX., p. 314.

PHOTOGRAPHIC COMPARISONS OF THE ILLUMINATING POWER OF INCANDESCENT MANTLES.

The depth of image obtained in a photographic negative depends upon many factors, among which may be enumerated: Time of exposure, diaphragm value of lens, quality of plate, kind and concentration of developer, temperature and duration of development, and, of course, the intensity of the source of light and its actinic value. Several of these factors re-appear in the production of the positive from the negative. With so many variables, some of which are not under control with any degree of exactness, it is impossible to expect consistent results and scientific accuracy. The exhibitor of the photographs [at the Institution's special general meeting, 1918] made a considerable advance by taking simultaneous photographs of two sources of light upon the same plate. By this means, both images are subjected to identical treatment throughout; but it does not follow that the results obtained are even then accurate representations of the original sources of light. The photographs exhibited suffer considerably from over-exposure and halation, It is well known that in the case of full or over exposure the depth of image is not even approximately proportional to the light flux falling on the plate; and moreover most makers pride themselves upon what they term the "latitude" of their plates—*i.e.*, that photographically satisfactory results can be obtained in spite of serious errors in exposure. This, being otherwise expressed, only means that the plates are not suited for indicating fine or even considerable differences in intensity of light when photographing incandescent mantles under uniform conditions. The method also only admits of comparing lights in pairs, and does not permit of accurate comparisons from day to day or month to month. On the whole, little reliance can be placed upon photographic methods for record work of this nature.

APPENDIX I.

WATER-BOILING TESTS.

TABLE to show the relation between thermal efficiency and B.Th.U. supplied as gas in order to raise the temperature of 1 quart of water from 60° to 212° Fahr.

Heat theoretically required in order to raise temperature of 1 Quart of water from 60° to 212° Fahr. . . . . 380 B.Th.U.

Thermal Efficiency =

$$\frac{380}{\text{Heat supplied as gas during heating from } 60^\circ \text{ to } 212^\circ} \times 100 \text{ p.ct.}$$

And conversely—

$$\text{Heat which must be supplied as gas to heat 1 quart of water from } 60^\circ \text{ to } 212^\circ \text{ Fahr.} = \frac{380 \times 100 \text{ B.Th.U.}}{\text{Thermal Efficiency}}$$

NOTE.—If the thermal efficiency is calculated upon the gross candle value the B.Th.U. to be supplied must be taken as . . . . . B.Th.U. gross.
If upon the net candle value . . . . . B.Th.U. net.

Thermal Efficiency P.Ct.	B.Th.U. which must be Supplied to Raise Temperature of 1 Qt. Water 60°-212° Fahr.	Thermal Efficiency P.Ct.	B.Th.U. which must be Supplied to Raise Temperature of 1 Qt. Water 60°-212° Fahr.
30	1266	50	760
31	1226	51	745
32	1188	52	731
33	1152	53	717
34	1118	54	704
35	1086	55	691
36	1056	56	679
37	1027	57	667
38	1000	58	655
39	974	59	644
40	950	60	633
41	927	61	623
42	904	62	613
43	884	63	603
44	864	64	594
45	844	65	585
46	826	66	576
47	808	67	567
48	792	68	559
49	776	69	551
50	760	70	543

APPENDIX II.

TEMPERATURE CORRECTIONS DURING GAS ANALYSIS.

During the course of the foregoing investigation, many gas analyses have been made, using the Bone-Wheeler apparatus. The peculiar construction of this apparatus renders it unnecessary to take note of barometric changes; but in any analysis which claims to be accurate temperature variations cannot be ignored. The correction of numerous readings to a common temperature, or to 0° C. is very tedious, and it is easy for errors of computation to arise, especially when shortened calculations or approximate methods are used.

To facilitate such correction the subjoined table was calculated and has been found of great service in our own work. It is therefore inserted for the benefit of those who may have similar

operations to carry out and wish to do so expeditiously and with accuracy. The table may be readily pinned up beside the apparatus.

The table is based upon the following facts:

The coefficient of expansion of a gas at 10° C. is $\frac{1}{273}$ of its volume at 10° C. per degree change of temperature.

The coefficient of expansion of a gas at 15° C. is $\frac{1}{288}$ of its volume at 15° C. per degree change of temperature.

The coefficient of expansion of a gas at 20° C. $\frac{1}{293}$ of its volume at 20° C. per degree change of temperature.

Or, the coefficients of expansion at 10° C. and 20° C. (50° and 70° Fahr. differ from that at 15° C. by only 1 part in 16,000 approximately.

This is, of course well within the accuracy of the methods of gas analysis, and the table is computed upon the above mean value.

50° to 70° Fahr. covers the temperature range of most gas analysis laboratories and the temperature variations during an analysis do not often exceed 2° C., with a water-jacketed burette.

The values given are correct to 0·1 scale division, which is closer than is actually necessary.

The table may be used to correct the gas volumes to a common temperature, usually the initial or final temperature during the analysis.

Burette Reading.	Correction to be applied to the gas volume, when the temperature changes by — °C from the initial temperature.										
	2°	1°	0·9	0·8	0·7	0·6	0·5	0·4	0·3	0·2	0·1
600	4·2	2·1	1·9	1·7	1·5	1·2	1·0	0·8	0·6	0·4	0·2
550	3·8	1·9	1·7	1·5	1·3	1·1	1·0	0·8	0·6	0·4	0·2
500	3·5	1·7	1·5	1·4	1·2	1·0	0·9	0·7	0·5	0·4	0·2
450	3·1	1·6	1·4	1·3	1·1	0·9	0·8	0·6	0·5	0·3	0·2
400	2·8	1·4	1·3	1·1	0·9	0·8	0·7	0·6	0·4	0·3	0·1
350	2·4	1·2	1·1	1·0	0·8	0·7	0·6	0·5	0·4	0·2	0·1
300	2·1	1·0	0·9	0·8	0·7	0·6	0·5	0·4	0·3	0·2	0·1
250	1·7	0·9	0·8	0·7	0·6	0·5	0·4	0·3	0·3	0·2	0·1
200	1·4	0·7	0·6	0·6	0·5	0·4	0·4	0·3	0·2	0·1	0·1
150	1·0	0·5	0·5	0·4	0·4	0·3	0·3	0·2	0·2	0·1	0·1
100	0·7	0·3	0·3	0·3	0·2	0·2	0·2	0·1	0·1	0·1	—
50	0·3	0·2	0·2	0·1	0·1	0·1	0·1	0·1	0·1	—	—

Add correction when temperature falls.
Deduct „ „ „ rises.

JAMES W. WOOD, *M.Sc., A.I.C.*

THE VALUATION AND METHODS OF ANALYSIS OF SPENT OXIDE.

By HAROLD G. COLMAN, D.Sc., and E. W. YEOMAN, B.Sc.

III.

METHODS FOR ESTIMATING TOTAL AMMONIA, FERROCYANIDES, CARBONYLFERROCYANIDES, AND THIOCYANATES.

OTHER determinations sometimes required in the case of spent oxide are those of total ammonia and of cyanogen in the form of ferrocyanides and thiocyanate.

The ammonia is present chiefly in the form of thiocyanate and sulphate, which may be extracted with water; but other quantities are present in the form of insoluble ferric ammonium ferrocyanides. The estimation of the total ammonia is carried out as in the analysis of sulphate of ammonia, by distilling 1 gram of the sample with caustic soda solution, and collecting the distillate in 25 cc. of normal sulphuric acid. The distillate is then titrated with normal caustic soda solution, using methyl orange as indicator. Each cubic centimetre of sulphuric acid neutralized equals 0·017 gram of NH_3. The only modification of the test advisable is that, in the distillation, the flask should only be heated by a small flame, and the ammonia distilled over by passing steam from a separate vessel through the liquid in the distilling flask. Otherwise, owing to solid oxide in the latter, serious bumping takes place, which may easily fracture the flask.

CYANOGEN COMPOUNDS.

The cyanogen is present chiefly in the form of ammonium thiocyanate and of insoluble ferric ammonium ferrocyanides; the latter being generally described as prussian blue, which term, in its common use, includes all ferrocyanides of iron having a blue colour. For analytical purposes, the results are always calculated in terms of pure prussian blue, Fe_7Cy_{18}. The proportion of cyanogen present as ferrocyanide to that present as thiocyanate is always higher in proportion to the effectiveness of the removal of ammonia from the gas before its entry into the oxide purifiers, and *vice versâ*. In addition, small quantities of carbonylferrocyanides—*i.e.*, iron or double iron and ammonium salts of carbonyl-ferrocyanic acid $H_3Fe(CO)Cy_5$—are mostly present.

During the past thirty years, a very large number of methods have been proposed for the estimation of the cyanogen derivatives in spent oxide, the mere enumeration of which would require several columns. We have tried a good many of these methods, and have found that the following procedure is the quickest consistent with a satisfactory degree of accuracy. The methods given have the advantage also that the only standard solution required is decinormal silver nitrate, which is the same as is required for the Davis and Foucar method for the estimation of the free sulphur.

Preliminary Treatment of the Spent Oxide.—As spent oxide loses some hydrocyanic on heating to 100°, the moist oxide, as sampled, must be taken for the analysis, and not the dried material. Ten grams of the sample ground to pass a 30-mesh sieve as already described, are weighed out into a capacious mortar, and 10 grams of solid caustic soda and 80 to 100 cc. of water are added. The mixture is then thoroughly triturated with the pestle till the solid material has been finely divided and brought into intimate contact with the caustic solution, and the whole allowed to stand for an hour with occasional trituration. Heating the solution must be avoided, as in hot solution the sodium sulphide formed by the action of the sulphur present on caustic soda acts on the ferrocyanides in the presence of ammonia, and converts them partially into thiocyanate; so that, if heating is carried out, the figure found for thiocyanate is too high, and that for ferrocyanide too low. After an hour, the mixture is diluted to abont 250 cc., and filtered through filter paper pulp on the pump, the residue well washed with water, and the combined filtrate and washings made up to 500 cc.

Combined Ferrocyanide + Carbonyl-ferrocyanide (Calculated as Prussian Blue, Fe_7Cy_{18}) and Ammonium Thiocyanate.—For the determination of these two figures, 50 cc. of the solution (= 1 gram of spent oxide) is taken, and sufficient ammonium sulphate added to convert the free caustic soda into ammonia, followed, for the removal of all sulphides, by agitation with lead carbonate rubbed to a cream with water. After filtering through filter paper pulp, the filtrate and washings are transferred to a beaker, heated to 40° C., and ferric alum solution added, carefully with stirring till the settled solution shows decidedly the blood-red colour of ferric thiocyanate. The precipitated blue contains all the ferrocyanide and carbonyl-ferrocyanide, and is filtered off through filter paper pulp on the pump, using only a vacuum of about 1 in. of mercury. The precipitate is washed with water containing some dissolved electrolyte—such as potassium, sodium, or ammonium sulphate—as pure water is apt to cause colloidal blue to run through the filter. The precipitate is employed for the estimation of the ferrocyanide *plus* carbonyl-ferrocyanide, and the filtrate for that of the thiocyanate.

(*a*) *Ferrocyanide + Carbonyl-ferrocyanide.*—The precipitate of prussian blue and filter paper pulp are washed into a beaker, and 25 cc. of normal caustic soda added and the whole well stirred to obtain intimate contact of the precipitate and alkali, when all ferrocyanide present is converted into sodium ferrocyanide. The mixture is filtered on a further bed of filter paper pulp, well washed with water, the filtrate and washings transferred to a flask, and the quantity of hydrocyanic acid present as ferrocyanides determined by Williams's method (J. Soc. Chem. Ind. 1912, p. 468). For this purpose the liquid is strongly acidified with dilute sulphuric acid (1:3) and 1 to 2 cc. of a 10 p.ct. solution of cuprous chloride in hydrochloric acid added. [Strips of metallic copper should be kept in the bottle containing the latter, to ensure its freedom from cupric salt, which interferes with the test.]

The whole is then distilled into about 25 c.c. of 10 p.ct. caustic soda solution, when all hydrocyanic acid present as ferrocyanide and carbonyl-ferrocyanide passes over. The distillation is continued with fairly rapid boiling for 25 to 30 minutes; the end of the condenser tube dipping beneath the surface of the liquid in the receiver. A few drops of potassium iodide are added as indicator, and the distillate titrated with N/10 $AgNO_3$ until a permanent yellow cloudiness of silver iodide is produced. Each cubic centimetre of N/10 $AgNO_3$ used is equivalent to 0·0054 gram of HCy, or 0·00956 gram. of Fe_7Cy_{18}. If exactly 1 gram has been

taken as above, the percentage of Fe_7Cy_{18} = cc. N/10 $AgNO_3$ used × 0·00956 × 100.

(*b*) *Thiocyanate.*—The filtrate from the prussian blue is transferred to a beaker, and made slightly acid. Sufficient sodium sulphite is added to destroy the colour of ferric thiocyanate, the solution heated to the boiling point, and the thiocyanate precipitated as cuprous thiocyanate by the addition of copper sulphate solution in excess. This is at once filtered off through filter paper pulp on the pump, using a moderate vacuum, washed, the precipitate and pulp transferred to a beaker. and thoroughly stirred with a warm solution of 1 gram of caustic soda or sodium carbonate free from chlorides. A few drops of ferric alum solution are then added, which, with the excess of alkali, will form ferric hydroxide, and render the subsequent filtration more easy. The mixture is then filtered through pulp, using about 1 in. vacuum, and washed with water; the filtrate then consisting of a pure solution of sodium thiocyanate. The well-cooled solution is acidified with dilute sulphuric acid and with nitric acid free from nitrous and hydrochloric acid; a little ferric alum solution is added; and the solution is titrated with N/10 $AgNO_3$ until the brown colour of ferric thiocyanate just disappears. Each cubic centimetre of N/10 $AgNO_3$ used equals 0·0076 gram of ammonium thiocyanate; and if 1 gram of the spent oxide was taken, the percentage of ammonium thiocyanate = cc. N/10 $AgNO_3$ used × 0·0076 × 100.

Determination of Ferrocyanide Proper, excluding Carbonyl-ferrocyanide.—For this estimation, 50 cc. of the solution, prepared as described above, is mixed with five times its volume of alcohol or methylated spirit. The ferrocyanides are thus completely precipitated along with any sulphates and carbonates present; while the carbonyl-ferrocyanides, thiocyanates, sulphides, and caustic soda remain in solution. Precipitation is complete in an hour; but if allowed to stand over night, the precipitate filters much more readily. After filtering, the precipitated ferrocyanide is washed with alcohol, dried in the water-oven, redissolved in water, and the hydrocyanic acid present as pure ferrocyanide determined by Williams's method, as described above. The percentage of true ferrocyanide calculated as prussian blue, if 1 gram of spent oxide has been taken = cc. N/10 $AgNO_3$ × 0·00956 × 100.

Carbonyl-ferrocyanide—The difference in the number of cubic centimetres of N/10 $AgNO_3$ used in the titrations without and with removal of carbonyl-ferrocyanides gives the amount of carbonyl-ferrocyanide present; each cubic centimetre of N/10 $AgNO_3$ being equivalent to 0·0108 gram of ferric carbonyl-ferrocyanide ($Fe.Fe(CO)Cy_5$). If 1 gram of the spent oxide has been taken, then the percentage of the latter will be equal to the difference in cc. N/10 $AgNO_3$ of the two titrations × 0·0108 × 100.

The above alcoholic filtrate from the pure ferrocyanide may be used for testing qualitatively for the presence of carbonyl-ferrocyanides in the spent oxide. For this purpose, lead carbonate is added to remove sulphide, and the filtered or settled solution acidified. To one portion ferric chloride or sulphate solution is added, when, if carbonyl-ferrocyanide is present, a beautiful purple coloration or precipitate of the ferric salt is obtained, readily distinguishable in colour from prussian blue. To a further portion copper sulphate solution may be added with which carbonyl-ferrocyanides give an apple-green precipitate, very different in appearance from the chocolate precipitate given by copper sulphate with ferrocyanides.

USE OF GAS IN ELECTRODE MANUFACTURE.

It will doubtless be of interest to gas engineers to know that electricity, in a field which is regarded as particularly its own—namely, the refining of steel—is dependent to a great extent upon the assistance of the gas-fired furnace in the manufacture of the electrodes for carrying the current. As is well known, these electrodes are usually of graphite or amorphous carbon; and the rôle they fill can be generally compared with the carbons in ordinary arc lamps.

The consumption of electrodes in the latest type of electric furnace working on steel is stated to be in the neighbourhood of 10 lbs. per ton of steel melted; but taking into consideration accidental breakages, we shall not be far wrong in stating that a fair figure would be at least 20 lbs. per ton of steel. In the melting of brass, for which the electric furnace has also been tentatively used—particularly in the United States—the consumption of electrodes is as low as 1½ lbs. per ton of brass, apart from accidental breakages. Even with the cheaper amorphous carbon electrodes at present-day prices of over £40 per ton, it will be seen that the question of electrode supplies is a most important one for steel makers.

Prior to the outbreak of war, Great Britain was to a large extent dependent upon overseas supplies of electrodes. But this is no longer the case, as their manufacture has now been undertaken in this country. The annealing of such material has presented certain difficulties in the past, on account of the very uniform temperature required throughout the heating chamber, which has to be maintained for long periods with great accuracy. On account of the affinity of carbon for oxygen, a perfect reducing atmosphere is essential during the annealing process; and it is, perhaps, needless to add that town gas is the fuel which has been found most suitable for this purpose.

The Davis Furnace Company, of the Diamond Foundry, Luton (who specialize in work of this description), supply a furnace for annealing electrodes. Referring to one particular furnace, for electrodes of the largest size, up to 22 in. diameter, which is installed in a works producing over 30,000 tons of electric steel per annum, the heating chamber measures 9 ft. wide by 6 ft. back to front, by 9 ft. high, and is arranged to accommodate six electrodes at a time. The refractory body of the furnace is built-up of a special fire-brick, with walls 9 in. thick, bound by means of channel irons and tie-rods. For the purpose of removing electrodes which may be accidentally broken during charging, and also for effecting slight repairs, a supplementary access door, 2 ft. by 2 ft., is fitted at one end; the door being of the hinged down-drop type, fastened by means of a clamp and screw. The top of the furnace, or cover-plate, is in three parts, of box section; and in addition to providing for the insertion and support of the electrodes, it also serves as a preheater for the air supply taken by the burners.

The burners fitted are the makers' well-known air-blast type, for consuming either town or producer gas at a pressure of about 2½ in. water-column, under a slight supplementary air pressure of about 6 in. The part which in all burners is the one that requires renewal from time to time (the nozzle) is formed of a refractory block, which can be easily and cheaply replaced. The furnace in question is provided with six burners, each with a 1¼ in. gas service and a 2½ in. air supply. Separate main-control cocks are provided for both gas and air; but the permanent gas rate of the burner is fixed by manipulation of the regulating plug. Three burners are placed on each side of the furnace, firing into combustion chambers or tunnels placed underneath the floor of the heating chamber, of such size and shape as to ensure complete combustion of the gas and air therein. The burners fire alternately from each side, to ensure even distribution of heat. The air supply for the burners is furnished by an ordinary open type of fan, and is forced through the 4-in. main air supply pipe on the top of the furnace, through various 3-in. inlet-tees, into the preheater chambers in the cover plates, and thence to the burners by separate 2½-in. lagged air-pipes.

When required, this type of furnace is provided with a heating chamber divided by a central partition wall into two compartments, so that, by means of suitable modifications to the system of firing, two kinds of electrodes, requiring different annealing temperatures, may be treated at the same time.

MODERN PRACTICE IN OFFICE LIGHTING.

Points to be Observed.

Members of the Illuminating Engineering Society, meeting on Tuesday last, were invited by Mr. A. Wise to consider some of the problems connected with office lighting. The paper was an extensive one; and it showed what a remarkable amount of detail there is that should be considered if rule-of-thumb practice in the lighting of offices is to be superseded by scientific application, with the view to making the lighting suit the work, and to get from it the greatest amount of convenience. As in industry, so in offices, the conditions of illumination have an important bearing on the facility with which work can be done; there is a close relationship between illumination and productive power.

Gathering together some of the points from the paper, broadly speaking, the lighting of offices divides itself into general and local lighting—the latter for special purposes. The selection of local or general lighting naturally depends largely upon the size of the office. Assuming that general lighting is employed, there is a further choice between direct, indirect, and semi-indirect lighting. General lighting requires good diffusion, in which the reflection of light from walls and ceilings should play an important part, to ensure that no worker is inconvenienced by shadow. On the other hand, in small rooms especially, where the needs of only one or two workers have to be considered, there is much to be said for the practice of providing illumination for each exactly adjusted to his needs. If local lamps are to be habitually used, it is very important that each unit should be well shaded; and in order to avoid excessive contrasts, there must be a moderate general illumination (say, of the order of 0·5 to 1 foot-candle) over the rest of the room. During recent years, there has been a progressive tendency towards general illumination from lamps mounted near the ceiling, well out of the range of vision. This has the substantial advantage that by proper design the illumination can be rendered adequate for any rearrangement of desks and tables in the room; whereas with local lights, though the lighting arrangements for each worker may possibly be more perfect, the system requires more readjustment every time the room is rearranged.

Indirect lighting has the great advantage of completely screening the source from the eyes of the worker, and thus eliminating glare. From the psychological standpoint, it has frequently been described as "cold;" and it is a question whether the depressing effect ascribed by some to the method has a real origin in the results of the system, or is merely the result of unfamiliarity. In order to meet this objection, the semi-indirect system, which permits of a visible source being seen, though of mild luminosity, has been introduced. The method of merely placing a diffusing bowl round the light source has frequently been described as "semi-

indirect" lighting. But in many cases this does not secure the inherent advantages of indirect lighting as regards distribution of light; and Mr. Wise, in common with others, has sought to meet this problem by adding to an indirect fitting a modification which produces the impression of "warmth" by allowing some visible source to be seen. Where the decorative effect is important, recourse has been had to the use of a semi-translucent reflector, fitting closely inside a glass bowl lined with some coloured material, such as silk. Another method is to leave a hole in the bottom of a metal bowl, approximately one-third of its diameter, and then insert some dense translucent substance (such as opal glass or alabaster) which transmits a soft glow. By inserting in the bowl the usual interior reflector, leaving only an aperture sufficiently large to cover the glass disc, practically all the available light can be directed on to the ceiling.

A great deal of thought has been given to the spacing of lighting units with a view to producing uniform illumination; the usual method being to divide the room into squares, and at the centre of each a unit is placed. The lighting engineer, however, must consider each problem on its merits; and the theoretical spacing of units must often be modifisd by the positions of beams and pillars. In both industrial and commercial lighting, the distance between adjacent units is commonly half the height; but this rule again is subject to variation according to the nature of the interior.

Reflectors used for commercial lighting may be of porcelain enamelled iron, stone enamelled metal, aluminized metal, mirrored glass, prismatic glass, opal or opalescent glass. Prismatic and diffusing glass are in general preferable for office use.

Very properly, Mr. Wise directed attention to one most important point in office lighting—the frequent cleaning of lamps and reflectors. This applies specially to overhead systems of lighting; the cleaning of bowls and reflectors being apt to be overlooked, owing to their considerable height above the floor-level. Accumulations of dust will often occasion a deterioration in illuminating efficiency to only 50 p.ct., or even, in extreme cases, 75 p.ct. of the initial value.

As to the quantity of illumination required, while in the past it has been common to assume 2 to 3 foot-candles as a minimum for reading purposes, experience shows that a considerably higher value is needed for most of the work in offices. In the experience of Mr. Wise, 4 to 6 foot-candles is desirable for general lighting; while for desk-work, which calls for close attention and constant reading of written characters, a somewhat higher value—say, 6 to 8 foot-candles—is not unduly high.

On the point of excessive contrasts in illumination, these are most likely to occur when reliance is placed on local lights; and there should be supplementary general illumination of (say) one-tenth of the working illumination at the desk, so that the eye is not fatigued by a sudden contrast in brightness when the gaze is transferred from the illuminated surface to the surroundings.

Among other matters dealt with in the paper were the avoidance of glare from polished surfaces, and of reflected light from paper, ledger surfaces, &c. Polished surfaces are objectionable, though often desired on decorative grounds. Consideration is recommended of matt-surfaces for furniture and walls; but these rather encourage dust accumulation. Regarding reflected light from paper surfaces, Mr. Wise favours carefully adjusted local lights. By selection of the angle at which light is received, direct reflections can be largely avoided. Avoidance of inconvenient shadows is another point that a lighting engineer has to consider; and the system of controlling the lights is also important.

The lighting of drawing offices was also dealt with. Two systems are at present in use: (1) Local lighting from individual points installed over each drawing-board; (2) general indirect lighting. Direct lighting has the advantage in dealing with dense tracings, where one has a peculiar double surface to deal with—viz., a more or less shiny cloth above and the drawing paper below. The position of the unit needs great care, as it must not shine in the worker's eyes, and must not be so placed as to cause inconvenient shadows from the instruments or from the worker's person. An efficient device that has been used with success is a standard consisting of a telescopic pedestal and arm, which enables the lamp to be adjusted to any desired height, and placed in the most convenient position over the board. The reflector used should be opaque, preferably of aluminium, vitreous enamel, lined steel, or porcelain. Half-frosted lamps are recommended; and an intensity of illumination of at least 8 foot-candles should be available. In view of the importance of avoiding glare and inconvenient shadows, there is much to be said for indirect lighting. The sources can then be arranged irrespective of the positions of the drawing boards. With indirect lighting, an illumination of 12 foot-candles is recommended.

This is only an indication of the contents of the paper, which was illustrated by several photographs. The discussion that followed was mainly on details; and, generally speaking, the recommendations of the author were not criticized, though personal views varied somewhat as to the foot-candles that are desirable for different classes of work.

Society of Engineers Premium.—The President's gold medal has been awarded to Mr. T. Roland Wollaston, for the paper read by him before the Society of Engineers, entitled a "Survey of the Power Bye-Product Problem." The paper was summarized in in the "JOURNAL" for April 16 last, p. 98.

DUTCH ASSOCIATION OF GAS ENGINEERS.

Annual General Meeting.

(*Continued from p.* 120.)

LIMITATION OF GAS CONSUMPTION.

Opening the discussion on the enforced limitation of gas consumption in Holland, Heer J. Ph. Bruinwold Riedel (Utrecht) said that, while the circular issued by the State Coal Distribution Department restricted consumption for industrial purposes to 30 p.ct. (of previous consumption), it was said that in some parts of the country the allowance had been extended. The fact was that when a gas-works received its ration of raw material (coal, &c.), it was at liberty to dispose of the gas which it could produce from it as seemed best in the local conditions, always provided that the private consumer was guaranteed his minimum ration. In certain manufacturing places, also, the working classes had been thrifty enough to prefer to cook over wood, so as to use no gas, in order that the gas so saved might be available in the industry in which they earned their living. They argued that gas for cooking would be of little or no service to them if their earnings ceased.

Several members stated that the restriction of consumption of gas for industrial purposes had caused consumers to introduce suction-gas producers, and that inspectors of the Coal Distribution Department had advised them to take this step, and in other cases to arrange for a supply of current. Heer Riedel explained that the anthracite which was available for suction-gas production would have been of no service for gas making. Against this view, however, it was said that the anthracite could have been used in place of gas coke, and a greater quantity of the latter thereby left available for water-gas manufacture on the gas-works. Other members considered that equally good results could have been achieved by appeal to consumers to exercise the strictest economy as by resort to rationing. It was pointed out that, owing to the earlier hours kept in the smaller towns, an equal ration of gas went farther than in the large towns.

The meeting then proceeded to an informal discussion of a number of questions which had been set down in the agenda.

PROPAGANDA.

The first of these questions was what measures should be taken by the Council of the Association towards organizing propaganda on the use of gas for cooking and heating, as well as industrial purposes, with a view to their adoption when rationing of gas came to an end. A supplement to this question concerned the enlightenment of the public on the unjust impressions which had gained a footing in recent years on the relative consumption of coal in gas and electricity works. The second question, which was discussed with the first, related to steps to be taken to further the supply of gas to outlying places, and to the advisability of appointing a Committee to assist in the matter.

Heer A. C. Koppejan (Amersfoort), in opening the discussion on these questions, said that gas-works should be accorded their fair share of the market with other suppliers of energy. Latterly officials had taken advantage of the abnormal circumstances to deprive gas-works of important markets, on the ground that it was in the interests of general economy. This matter needed clearing up. It was evident that in future gas-works would assume more and more the character of great central stations for the distribution of heat, and this distribution would extend to greater distances than formerly. If doubt is expressed as to whether gas-works will survive as central stations for the supply of heat in the future, it may be demonstrated beyond question that they afford a better return of heat (for the coal expended) than do central electricity supply stations. The point has been discussed at length in technical papers, such as (in Holland) "De Ingenieur;" but the comparison between gas and electricity works in respect of efficiency as heat suppliers should be set out in the propaganda campaign for which the Council of the Association should appoint a Committee, which could deal both with the general question and with the supply of gas over large areas and outlying districts. The State should make a similar grant (of about £2000) for a scheme for a central gas supply works for North Holland, as it has already made for a scheme for a central electricity station. The question of the proper scope of the two industries in the future must be considered from all aspects. If it is argued that electricity can be supplied over Holland from the pits' mouth, it must be remembered that coke-ovens can be erected on gas-works. Whether the works at which the ovens are erected should be at the pits' mouth, or close to the city—*e.g.*, Amsterdam—to be supplied with heat is a question which can only be answered after consideration of the local circumstances of each particular case. It may be found best to distribute the coke-ovens over the country, in which case small gas-works would gradually disappear. The ovens would supply gas of the lower calorific value which is recognized as suitable for supplies at the present time. When gas was used chiefly for lighting, the efficiency of a small gas-works was nearly as great as that of a large one; but things had now changed, and gas was almost becoming a bye-product, with coke as the main product. Moreover, small gas-works could not use vertical retorts. For these reasons the day of small gas-works seemed passing, and the day coming of a few large works distributing under high-pressure all over Holland.

Comparing gas with electricity works as distributors of heat, the speaker quoted an article by Heer Erens, of Arnheim, which appeared a few years ago in "De Ingenieur," in which it was shown that in practice only 6·5 p.ct. of the calorific power of the coal consumed in the electricity works was utilized as heat by the consumer, whereas an average efficiency of 16 p.ct. was actually obtained at the time from the coal carbonized in gas-works. By way of comparison, the theoretical possibilities of the two may be worked out—theoretical being taken to mean what is in any way practicable with improved plant, &c., in the future, after due allowance for absolutely unavoidable losses in generation, distribution, utilization, &c.

Starting with electricity, let it be assumed that 95 p.ct. of the heat developed by the fuel is obtained at the main steam-valve of the engine in the form of steam. Actually, the efficiency of a boiler is only 85 p.ct.; but to be on the safe side, 95 p.ct. is taken, in case it may be argued that in 50 or 100 years such an efficiency will be attainable. It is also assumed that coal must be used in the generating station, because water power is not available in Holland. Passing to the ideal engine, which delivers mechanical energy from either steam or gas, there is an inevitable loss. The complete Carnot's cycle is very badly approached by our steam-engines. Gas and Diesel engines come nearer to it; but there is nothing which realizes it. If three-quarters of the effect of the Carnot cycle were ever realized in the future, it would be a magnificent accomplishment. For the steam-engine, which at the moment converts 19 to 20 p.ct. of the steam into mechanical energy, an extreme assumption for the next 50 or 100 years would be 50 p.ct. The ideal Carnot cycle for a steam-engine may be stated somewhat as follows: Take steam superheated to 500° C. (no managers of electricity works can hope to exceed this in the immediate future) and a condensation temperature of − 173° C., attained by means of sulphur dioxide cooling machines. Then, since the absolute zero is − 273° C., it follows that the efficiency co-efficient would be:

$$\frac{773 - 100}{773} = \frac{673}{773} = 0{\cdot}88$$

The ideal Carnot cycle can, however, be no more than half realized. Consequently, the efficiency of the engine is at the most only 44 p.ct. Equally favourable assumptions for the gas-engine would show an attainable efficiency of 56 p.ct., as compared with 29 to 32 p.ct. attained in Diesel engines at the present time. Taking the mean between these figures for the steam and gas engine, the ideal figure for the efficiency attainable in the next 50 or 100 years for the conversion to mechanical energy is 50 p.ct.

The next step is the conversion of mechanical energy into electricity; and with this may be taken the loss in the distributing system, which with large central works is 15 p.ct., and with small electricity supply works 25 to 30 p.ct. If, however, the losses in generation of current and in the distributing system are together taken at only 10 p.ct., we have the extremely optimistic attainable efficiency of 90 p.ct. at this stage. Let it be assumed again that the user secures the very high efficiency in his cooking appliances of 95 p.ct., then the proportion of the calorific value of the coal consumed which the user of electricity is ever likely to be able to utilize is: $100 \times 0{\cdot}95 \times 0{\cdot}50 \times 0{\cdot}90 \times 0{\cdot}95 = 41$ p.ct. This 41 p.ct. possibly attainable in future compares very favourably with the 6·5 p.ct., which Erens gives as the efficiency actually secured at the present time.

Passing on to gas supply, and taking the calorific value of a ton of coal (at 13,050 B.Th.U. per lb.) as 29,232,000 B.Th.U., and the make of gas (of the average calorific power of 420 B.Th.U. per cubic foot) at 14,280 to 15,440 c.ft. per ton, the B.Th.U. in the gas amount to at least 6,000,000. An efficiency of 95 p.ct. has been taken for electrical appliances, which is too high at present for gas, though 90 p.ct. efficiency is attained by gas-stoves, 60 p.ct. by hot plates, and 95 p.ct. by surface combustion heating plant. Taking only the moderate figure of 60 p.ct., the B.Th.U. utilized by the gas consumer per ton of coal should be at least 3,600,000. The figures for the make and calorific power of gas are such as can be realized in large oven carbonizers, which would deliver a great quantity of saleable coke with little breeze—the heating of the settings being done through central producers, as at Budapest. In these conditions, it may be assumed that coke equal in weight to 60 p.ct. of the coal carbonized will be available for sale—a consummation which can be achieved to-morrow, even if it is not to-day. If this coke has a calorific value of 11,250 B.Th.U. per lb., and when used in boiler plant gives an efficiency of 85 p.ct. (against the 95 p.ct. efficiency of boilers assumed as attainable in electricity supply works), it will be seen that the coke from a ton of coal renders serviceable about 12,850,000 B.Th.U. Neglecting the value of the tar (which, it may be assumed, will not be used as fuel in the future), ammonia, and other bye-products, there is utilized in the gas and the coke a total of 3,600,000 + 12,850,000 = 16,450,000 B.Th.U., or over 55 p.ct. of the calorific power of the ton of coal carbonized, as compared with a maximum efficiency ideally attainable from a ton of coal by electricity.

It may be asked if electricity cannot be sold more cheaply for heating than for other purposes, as, indeed, it can, because electricity works are in the same position as gas-works before gasholders were invented, and their product must be delivered as soon as it is made. But in any case, for whatever purpose electricity is sold, the efficiency of conversion of the heat value of the coal into electricity is lower than the efficiency of conversion of coal into gas. What is to be done? The future only can answer; but the outstanding fact is that electricity supply works ought not to supply current for general heating purposes. They render a poorer return in heat units utilizable per ton of coal used than do gas-works.

Is the efficiency of 41 p.ct. arrived at in the foregoing for electricity likely to be attained in the future? It would appear not. The present efficiency of an electricity station is 6·5 p.ct., against 16 p.ct. for a gas-works; and it would be very optimistic to raise the former figure to 13 p.ct., and not over optimistic to take 20 p.ct. for gas-works in future (against the ideal figures of 41 and 55 p.ct. respectively). We know how many heat units there are in a unit of electricity and how many in 1000 c.ft. of gas. What, then, should be the relative cost of the heat unit supplied through either agency at these efficiencies? The ratio is that electricity, as delivered and used by the consumer, must be, and remain, 2½ times as dear as gas so delivered and used for heating purposes.

This outstanding fact of the greater economy of the utilization of the heating value of coal when it is converted into, and used as, gas than when it is converted into, and used as, electricity, should be brought before the public and authorities by the Committee which the Association should set up for propaganda purposes.

Heer Koppejan's long and masterly address, of which the foregoing is a summary, was received with applause; and the Chairman at once expressed the thanks of the meeting to him for it. He announced that the Council did not propose to set up a Propaganda Committee forthwith, but would be prepared to do so immediately the time was ripe. Meantime, the Council had arranged for the Director of the Central Dutch Gas Bureau (Heer J. H. Janson) to join the British Commercial Gas Association and the kindred German body, in order to follow the methods of propaganda in other countries. Some further support to the funds of the Association would, however, be required when steps were actually taken; but the Central Gas Bureau would take the initiative as soon as necessary, with the co-operation of members of the Association.

Heer P. Hijdelaar (Zeist) spoke at some length on the question of the institution of a Committee to study and report on the supply of gas to outlying districts. The Chairman then announced that the Council asked the authority of the meeting to nominate a Committee of five members to make such an investigation and report. The report would deal with such points as to what distances and at what pressures the supply of gas would be feasible and remunerative; and the Committee would comprise those members who had studied these questions most fully. The meeting, having agreed to the Council's proposal, passed on to the discussion of a third question relating to the use of coal gas in place of petrol for motor vehicles.

(To be continued.)

Oxy-Acetylene Welding.

Three papers on the question of oxy-acetylene welding were submitted to a meeting of the Institution of Mechanical Engineers last Friday; one of them being by Mr. Henry Cave, of Hartford (Conn.), who described the development of the industry in the United States. About 1909, Thomas A. Edison introduced from abroad some special machines to weld automatically the seams of the containers used in his storage batteries; these probably being the first machines to be used in America for actual commercial work. The Davis-Bournonville Company have expended large sums of money in developing machines of a variety of types for both welding and cutting; in a general way using an electric motor for their operation. The development of the use of mechanical welding for the manufacture of tubes has been very extensive the last few years. The cost is very much lower than for the solid-drawn product; and when the welded tube is re-drawn, there is very little difference in appearance or accuracy. The use of the welding-torch operated by hand has attained tremendous proportions in connection with repair work; but the welding of defective castings in the foundries has not developed to an extent that might naturally be expected. The welding of gas-mains has developed rapidly within the last two or three years, for high-pressure service between townships. The welding of the large mains for the Panama-Pacific Exposition, and the subsequent publicity, gave a great impetus to the use of the process for this purpose. At recent demonstrations of pipe-welding, 4-in. pipe was welded in 3 min. 20 sec. actual welding time, and joints needed in 2-in. pipe were made at the average rate of 1½ min. per joint. The war has caused a much greater advance in the application of the cutting torch than in that of welding. The author of the second paper, Mr. J. H. Davies, of the Central Technical School, Leeds, declared that Germany is far more advanced than Great Britain in the oxy-acetylene process, which, when properly worked, possesses numerous marked advantages over all others. The oxy-acetylene flame has recently been applied to the case-hardening process; and some firms are using it on a large scale. If a flame containing an excess of acetylene is held for two minutes on the white-hot surface, a hardness equal to that obtained with the most energetic case-hardening mixtures is secured. In the third paper, Mr. F. Hazledine, of the London and North-Western Railway, gave an account of some of some of the work done at Crewe by oxy-acetylene welding.

AMMONIA AND TAR PRODUCTS.

CHAS. PAGE & Co.

MERCHANTS. 47/51, KING WILLIAM ST., LONDON, E.C. EXPORTERS.

Suppliers of Benzol Washing Oil.

PICKS, WEDGES, HAMMERS, AXES, &c.

FORKS, GRAFTS, SHOVELS, SCOOPS, &c.

Tel. Add.: "YATONIAN."

Tel. Nos.: East 400, 401, & 402.

JOHN YATES & CO., Ld.,

Aston Manor, BIRMINGHAM,

MANUFACTURERS SINCE 1804

ALL BRITISH

VICES, CUTTERS, BUCKETS, BARROWS, SCREENS, &c.

GAS WORKS TOOLS & APPLIANCES of all kinds.

WATER GAS PLANT.

ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED,

36, Victoria Street, London, S.W.

COAL TAR AND AMMONIA PRODUCTS.

Benzole, Toluole, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Dark Cresylic Acid, Granulated (Crude) and Sublimed Naphthalene, Beta Naphthol, Anthracene, Refined Tar and Pitch. Sulphate of Ammonia containing a Guaranteed Minimum of 25 per cent. Ammonia.

For Prices apply to the SOUTH METROPOLITAN GAS COMPANY,

Telegraphic Address
Inland: "Metrogas, Peck, London."
Foreign: "Metrogas, London."

709, Old Kent Road, LONDON, S.E. 15.

Saml Cutler & Sons Ltd

Engineers and Contractors

Complete plants for the production of

Coal Gas, Water Gas, Hydrogen Gas.

Providence Iron Works, Millwall. **London.** 59, Victoria Street, Westminster.

GASHOLDERS

MILBOURNE PATENT ROLLER CARRIAGES. AUTOMATIC LUBRICATION.

PURIFIERS

WITH

MILBOURNE PATENT DUPLEX VALVES, AUTOMATIC COVER FASTENERS, SAFETY DISCHARGE SHOOTS, RUBBER JOINTING. "MILBEL" PATENT PURIFIER GRIDS.

CONDENSERS, SCRUBBERS, AND GAS WORKS PLANT OF EVERY DESCRIPTION.

C. & W. WALKER, LTD., DONNINGTON, NEWPORT—SALOP.

LONDON OFFICE: 110, CANNON STREET, E.C.

MANUFACTURE OF SULPHURIC ACID BY THE CHAMBER PROCESS.

By GEORGE CHRISP.

[A Paper read before the Midland Section of the Coke-Oven Managers' Association at Leeds, Jan. 25.]

Although sulphuric acid is not at present regarded as a bye-product of the coking industry, the probabilities are that in the future it will be recognized as such, by reason of developments in processes for the recovery of the sulphur compounds in our coal. No apology, therefore, is made by the writer for having taken up what may be considered as an out-subject, as, while he believes the relation between sulphuric acid and coke-ovens will eventually become closer than at present—if merely through increased requirements on the plant—it is already of sufficient importance to warrant an outline of the works process of its manufacture being of interest to his colleagues, to whom, of course, the accepted theory of the process is well known.

Most of the sulphuric acid manufactured in this country is produced from pyrites, of which we imported prior to 1914 some 800,000 tons annually. During the war, the importation was more than doubled, to meet the requirements of acid for explosives. Sicilian brimstone appears to have been solely used up to 1838, when the grant of a monopoly of this material to a private firm by the Neapolitan Government resulted in the price rising from £5 to £14 per ton, and a search being made for other and cheaper sources of sulphur. Some fifteen patents for pyrites roasters were taken out at this period; and though the abolition of the monopoly, through diplomatic pressure, was obtained, many acid makers declined to return to the use of brimstone. The owners of pyrites mines very naturally encouraged this attitude, and finally succeeded in almost completely ousting brimstone from the trade. Possibly a deciding factor was the valuable cupreous ore, the sulphur of which was merely a bye-product, and almost a nuisance.

PYRITES BURNERS.

In using pyrites, it was at first believed necessary to have auxiliary heat, such as that from coal, to maintain combustion; but CO_2 naturally interfered with the subsequent process. The pyrites generally arrives from the mines in lumps, which have to be broken before use in burners; and as a result of the crushing, more "fines" is made than the ordinary kiln burner can deal with. Hence the advent of the mechanical furnace. The modern kiln or stone burner is of comparatively simple construction, consisting chiefly of a cast-iron box lined internally with brick, and having a grate with movable bars to support the stone. It is usually 4 or 5 ft. square by 6 ft. high, and several constitute a set. The grate is 18 in. to 2 ft. from the floor, leaving room for the burnt stone to fall clear when the bars are rotated to discharge it. In the front are doors for feeding and discharging, air-inlet, and grate-bar key. The gas-outlet is at the top.

Many varieties of mechanical burners are on the market, one of the earliest being known as the M'Dougall, the general principles of which are to be found in most of those of later design. It is a metal cylinder, 6 ft. dia. by 12 ft. high, formed of seven shelves, through which passes a central shaft, fixed to which are cast-iron arms having teeth on the lower portion (one arm in each shelf). The teeth in alternate arms are placed at opposite angles; so that, as the central shaft rotates, the ore on the shelf is propelled, in one case from the centre to the periphery, and in the next from the periphery to the centre. The fine ore, in pieces from ¾ in. to zero, is elevated and discharged on to the top floor, where it is dried by the heat from below while being propelled by the rabbled arm towards the feed-box, whence it is passed into a first combustion tray by means of a plunger operated by reciprocating rods moved by the shaft drive-gear.

Practically all modern mechanical burners resemble in many respects this design, but are much elaborated and improved. The Moritz burner, of the working of which the writer has some experience, consists of a cylindrical steel shell lined with fire-brick, which supports nine domed floors, also of fire-brick, forming eight shelves, having a total hearth area of over 1100 sq. ft., and therefore capable of roasting about 8 tons of pyrites per diem. Four of the floors are provided with openings at the periphery for discharging ore on to the tray below; and these floors are keyed to rings closely surrounding the central shaft. Four others have a larger central orifice (terminating some distance from the shaft), over the edge of which the ore falls. The ninth dome is the burner-roof, in which is the gas-outlet. Each tray is about 18 in. deep by 14 ft. dia. The floors are made some 4 in. thick; and the component bricks are keyed in concentric rings. This keying, with dovetail joints and a spring of some few inches, ensures stability, while permitting "breathing" due to expansion or contraction which occurs through temperature variations.

The central shaft is of cast iron, 18 in. dia. and quite hollow, except that the upper portion has an internal tube connected to the outer at the arm-pockets. It is supported on a special bearing attached at the bottom to a crown wheel with a bevel pinion operated by a chain-drive. At the top an eccentric and cam arrangement is attached, which in turn works a plunger feed for the ore from the hopper to the first tray through a sealed box. Two cast-iron arms in each tray are fixed to the shaft by a bayonet-lock device of special design, so arranged that, while the shaft rotates in its proper (clockwise) direction, the pressure of the ore against the rabbles has a tightening effect. To remove a worn-out arm, it is only necessary to pull it in the contrary direction, when it is at once free. Broken arms are rather more difficult to deal with—especially if the stump remaining is short.

Gas-tight doors are provided in each tray for the removal of clinker, changing arms, &c.; and sight-holes in the doors permit easy inspection. Air is admitted in the bottom tray, and regulation controlled here by slides. The burnt ore is discharged from the bottom tray by a trap worked by a knock-off on a crown wheel. The feed can readily be adjusted by lengthening or shortening the plunger stroke. The central column or shaft is connected to a small fan which delivers air for cooling purposes. Air passes up the shaft and along the arms of the upper five trays, where the heat is greatest. These arms have a double passage along their entire length for the flow and return of cooling air, which latter passes to the internal tube of the shaft, and is utilized for heating the overhead pyrites drying floor.

OPERATING A FURNACE.

In starting-up a furnace, the shelves of the upper trays are usually covered with burnt ore, and wood fires started in the bottom tray. These are gradually increased as the burner dries and warms-up; and finally the cinders in the upper shelves are hot enough to induce combustion of green ore. Much time can be saved if a little spent oxide be introduced, though this necessitates careful air regulation and attention to avoid distillation of sulphur, which would deposit and cause subsequent trouble. Once the green ore is burning, sufficient heat is soon generated to provide proper combustion, as the heat of the exothermic reaction, which is according to the following formula, is considerable:

$$4FeS_2 + 11O_2 = 2Fe_2O_3 + 8SO_2$$

The great objection to all mechanical burners is dust, which is produced chiefly through the stirring of the ore, and carried forward with the gases. Many attempts have been made to overcome this difficulty, by means of filters of broken bricks, &c., baffles and chambers, or flues permitting slow travel of the gases to induce dust deposition, all of which methods cause loss of very valuable heat in varying degree by radiation; and if their primary function is not satisfactorily performed, much trouble with blockages and loss of nitre ensues. The burner gases are usually exhausted by a multiple speed fan, and delivered over nitre pots into the Glover tower.

To provide the necessary oxygen for conversion of the SO_2, two methods are in common use—first, sodium nitrate, reacting with sulphuric acid in a potting oven before the Glover tower; secondly, nitric acid fed direct into the Glover tower. The potting oven is, in effect, a small nitric acid plant, and is usually an enlargement of the gas flue, containing two or more metal pots into which weighed or measured quantities of $NaNO_3$ and H_2SO_4 are fed. The gases are sufficiently hot to procure decomposition of the nitrate, but not so hot as to produce salt cake; nor is the complete reaction desirable, sodium bisulphate or nitre cake being produced—

$$NaNO_3 + H_2SO_4 = NaHSO_4 + HNO_3.$$

An excess of acid is always used. The nitre is generally charged in alternate pots every half-hour, and the fluid nitre cake run off periodically.

The second method of administering nitre is to supply a small flow of weak nitric acid continuously at the Glover tower top; and though many practical men of far wider experience than the writer will not agree, he considers this method to be more satisfactory and economical eventually than the former—especially with mechanical furnaces. Another method—and one which is coming into favour rapidly—is the ammonia oxidation process, wherein ammonia gas and air in certain proportions are passed through a catalyzer, and the nitrogen oxides here formed are partially cooled and passed into the first chamber near the inlet from the Glover tower. A fourth method is that recently described by Mr. Kilburn Scott, who proposed to oxidize atmospheric nitrogen by electric flame arcs.*

The composition of the burner gases should be kept as constant as possible by the regulation of the ore-feed and air-supply; and a fairly high saturation should be aimed at—especially if moderately intensive chamber working is proposed. With an average pyrites containing about 46 p.ct. sulphur, not much difficulty will be experienced in maintaining a burner exit gas of 7 p.ct. of SO_2 and 9 p.ct. of oxygen by volume—this being sufficient oxygen to ensure complete oxidation of the nitrogen compounds in the chambers later on. The composition of the gases will have varied somewhat before reaching the potting oven or Glover tower, owing to some conversion of SO_2 to SO_3 *en route*.

THE GLOVER TOWER.

The Glover tower is a very important item of the plant. It serves a variety of purposes, chief of which are: (*a*) Denitrating the Gay Lussac acid. (*b*) Cooling the hot burner gases. (*c*) Concentrating chamber acid. (*d*) Producing acid. The design and construction of this tower have a very decided bearing on the success of the plant. Its capacity must be ample for (*a*) and (*b*); but, if too large, some of the evaporated water from the chamber acid will condense, and a weak Glover acid result.

* "JOURNAL," Vol. CXXXIX., p. 235.

The tower consists of a heavy lead shell, cylindrical, square, or rectangular, but preferably cylindrical, lined with acid and heat-resisting material, the design and selection of which are of paramount importance. Volvic stone, Nori and Buckley ware, glass, and various patent packings are severally advocated. Some considerations affecting a selection are durability, weight, amount of free space provided consistent with efficient scrubbing, and cost. The inlet or burner pipe is near the bottom on one side, and must be carefully proportioned to suit the size and type of plant. It should decline from the burners to the Glover tower, to avoid back splash; while the Glover tower base should be set rather higher than the burner-top, to assist draught. The internal packing may be carried on slabs supported by pigeon-holed pillar walls, but preferably upon arches. The gas-outlet is near the top, on one side.

The flow of mixed acids feeding the Glover tower passes through a distributor of simple design—the Barker's mill type being very suitable—and enters the tower by many small pipes. The pond or dish at the base need not be more than (say) 3 ft. by 2 ft. by 8 in. deep. The acid it contains acts as a seal; and there is occasionally a water-jacket round the pond and tower base for cooling purposes, as the temperature of acid discharge is usually over 100° C. The Twaddel of the acid is as a rule over 144°—148° being good practice.

Leaving the Glover tower, the acid passes through coolers composed of water-fed coils of lead pipe enclosed in lead vessels, or open troughs of lead with water countercurrent, and then to sedimentation tanks for the settlement of iron salts. Thence it is delivered through acid eggs by compressed air to tanks over the tower floor; a portion being retained for circulation purposes, and the remainder run to storage tanks for sale. The gases leaving the tower consist of oxides of sulphur and nitrogen, air, and water vapour, and have a temperature of about 80° C. as they enter the first chamber.

Reactions in the Chambers.

Diversity of opinion exists as to the most suitable shape and proportions of chambers, the position of inlets and outlets, and the method of support. Probably the majority of English chambers are less than 25 ft. high, between 20 ft. and 30 ft. wide, and up to 100 ft. long. They are usually supported by timber framework, to which they are attached at several points by lead lugs. The chambers themselves are, of course, constructed of light section lead. A modern tendency is to have chambers up to 45 ft. high, and of a reduced length. The domed top is becoming general. These high chambers are supported from the steel principals of the chamber-house roof. The dish, or upstand, for the reception of the chamber acid is merely a lead vessel a few inches longer and wider than the chamber itself, and about 24 in. high. Fittings include water-sprays and steam-jets, sight-boxes, Twaddel drips, thermometers, and gauges for indicating the slight pressure or suction existing during work. Many forms of water-sprays are available—one in common use being the Berks atomizer, which is of glass, and similar to an acetylene burner, producing jets which impinge when the water is applied under a pressure of 60 lbs. per sq. in. Another, known as the Primavesi spray, whereby the water mist is caused by air pressure forcing the water through tiny orifices, is well spoken of, though one might consider the "false air" thus passed into the chambers to be a disadvantage. The water supply should be as pure as possible, and is invariably filtered once or twice before reaching the sprays.

The various reactions occurring in the chambers are even yet incompletely understood, and have been a subject of much controversy. The following may be said to be an elementary description of the eventual combinations:

$$3SO_2+2HNO_3+2H_2O=3H_2SO_4+2NO.$$
$$2NO+O_2=N_2O_4.$$
$$2SO_2+N_2O_4+2H_2O=2H_2SO_4+2NO.$$

The SO_2 of the burner gases and water or steam react with nitre, forming sulphuric acid and nitric oxide. The latter is re-oxidized by oxygen from the air admitted to the burners, to nitric peroxide, which reacts with more SO_2 and water, so long as the conditions are favourable. These changes go on as the gases pass from chamber to chamber, until finally, towards the end of the last chamber, little SO_2 remains, and the nitrogen compounds are available for recovery by the Gay Lussac tower or towers. These are somewhat similar in construction to the Glover tower, but taller, and are in effect scrubbers. They are usually packed with coke; but here, again, specially designed packings are coming into favour, as they are more durable, and provide more gas or free space with greater contact surface.

Cooled Glover acid of 144° Twaddel is sprayed into the towers, which work in series; the acid discharge of one constituting the feed of the other, and by means of which available nitrogen oxides are absorbed. The nitrous vitriol or nitro-sulphuric acid resulting is then delivered to the Glover tower for the double purpose of denitration of the acid and supply of gaseous nitre to the chambers. This is really the main supply, as the amount potted or fed direct is only the make-up for loss in the process. Between the two towers a tail fan of Regulus metal is installed to exhaust the gases, or an air-jet is sometimes used in the vent of the last tower for the same purpose. From the vent, the spent gases exit to the atmosphere.

In operating a chamber set, consideration must be given to the various proportions of the component parts of the plant, when deciding the possible output. Rough rules are sometimes given of (say) 12 c.ft. of chamber space per pound of sulphur burnt per 24 hours, a Glover tower with a capacity of 2 p.ct., and Gay-Lussac plant of 5 p.ct. of the chamber space. This amount of chamber space is not unreasonable, although some plants have 18 or 20 ft., while others work lower than 12 ft. Indeed, some specially designed chambers work at 4 ft. The rule given for the tower may be right or otherwise, according to the type of packing used. The burner trunk should be of ample proportions, to avoid undue gas velocity. With two burners of 8 tons maximum capacity per diem, 90 p.ct. load would be maintained, and 150,000 c.ft. of chamber space would not be too much to allow for comfortable working.

As far as possible, uniform and regular conditions must, to obtain satisfactory results, prevail throughout the plant, and careful and systematic technical control be exercised. Regulation of the air supply and constant feed will ensure that little variation in the composition of the burner gases ensues. An Orsat test should be made of this every three hours. The nitre supply must be regular and sufficient. The amount required of nitre (or its equivalent in nitric acid) for the above consumption of ore would be about 18 lbs. per hour. The flow of nitrous vitriol on the Glover tower must be continuous; and the stronger in "nitrosity" it is, the less the flow need be—so permitting of a good flow of chamber acid for concentrating. A useful strength is 50 oz. of sodium nitrate per c.ft. of acid (corresponding to about 14 c.c NO per c.c. acid). The water or steam supply to the chambers must be just adequate; and reference to drips and temperatures every hour will indicate whether adjustment is necessary. The front chamber usually receives sufficient water vapour from the Glover tower. The drip strength should be 116° to 120° Twaddel, while the temperature may be 70° to 75° C. The second chamber may have a higher drip with a reduced temperature; and in the third and fourth there will be a progressive diminution in both as the reaction tails off through exhaustion of the sulphur. They may be 105° Twaddel 50° C., and 90° Twaddel 30° C., respectively.

A solution of ferrous sulphate is a useful indicator as to the presence or absence of nitre at the drips; the "ring" obtained being more pronounced towards the end of the set. A "sulphur" atmosphere in the last chamber appears to promote healthy absorption of nitrogen oxides in the Gay Lussac plant, probably by reducing NO_2 to N_2O_3, which is more readily picked up by sulphuric acid; but too much SO_2 will reduce the N_2O_3 further, with consequent loss. If the temperature of the gases leaving the last chamber be too low, they have a tendency to inhibit absorption in the Gay-Lussac towers.

Tests of the acid leaving both Gay Lussac towers for nitre equivalent and the various stocks of nitrous vitriol will indicate whether loss is going on; and a balance-sheet from these tests should be made every three hours. The exit or vent of the plant should be frequently tested to ascertain whether the evacuated gases comply with the statutory allowance of SO_2, while the oxygen content here is a valuable check on the air regulation of the burners.

Eliminating Dust and Arsenic.

A somewhat novel method of treating the burner gases to eliminate dust and arsenic has recently been designed and put to work by Messrs. Simon-Carvès, Ltd., and has met with very considerable success. The hot gases from the burners pass through a dust collector to a wash-tower, where they are scrubbed by sulphuric acid, which removes most of the dust and arsenic. They are then drawn through coke filters for the removal of final traces of the dust, and return for reheating, which is partially effected by countercurrent flow with hot gases in the dust chamber, and finally by heat from the coke furnace. The gases (now practically arsenic free) enter the Glover tower, after passing the nitre pots, and are then treated as in the usual process. Acid produced by this method is almost water-white, and contains so little arsenic that it may be described as commercially non-arsenical—results which would certainly appear to justify the higher initial cost of the plant, and the expense incurred in reheating the cooled gases. The wash-tower acid is used over and over again, until too thick for its purpose, when it is disposed of for fertilizer manufacture. It represents but a small percentage of the plant's output.

With many ores operated by the usual type of plant, dearsenication of the resultant acid is necessary, especially if the acid be required for certain explosives. A very efficient dearsenicating plant is supplied by Messrs. Davis Bros. It consists of a four-chamber cast-iron cylinder, through which passes a shaft fitted with a set of paddles or impellers to each chamber. Acid is fed in continuously, sprayed by the paddles, and meets a flow of H_2S from a generating set installed near by. The precipitated sulphide of arsenic is filtered off, and the dearsenicated acid (often absolutely arsenic-free) may then be concentrated to any strength that is desired.

For 168° Twaddel acid, or B.O.V., the cascade concentrator fitted with basins of fused silica or of some silicon alloy, such as Narki metal, has been largely employed, especially until Kessler's and Gaillard towers came into more general use. The cascade method of concentration is wasteful, costly, and decidedly unpleasant. For running-up chamber acid to B.O.V. of 144° Twaddel or so, a very efficient apparatus is now on the market, also by Messrs. Davis Bros. It consists of a rectangular box of heat and acid resisting material, some 16 ft. long, 6 ft. high, and 2 ft. 6 in. wide. A shaft of special metal, with impellers just fouling the

acid inside the box, rotates at a fairly high speed, and produces a spray through which gases at a high temperature from a step-grate coke-furnace are drawn. The acid-feed is continuous, and as much as 24 tons of 144° Twaddel acid per day can be produced from chamber acid of 116° Twaddel, with a consumption of 1 ton of coke. The vapours pass through a coke-scrubber for condensing any acid carried forward.

COKE-OVEN MANAGERS' ASSOCIATION.

MIDLAND SECTION.

The Meeting of the Midland Section of the Coke-Oven Managers' Association, at which the paper by Mr. George Chrisp appearing on the preceding pages was read, was held last Saturday afternoon, in the lecture room of the Department of Metallurgy, Leeds University, under the presidency of Mr. J. A. WILSON, of Staveley.

The PRESIDENT said he was very glad the Council had been able to persuade Mr. Chrisp, of Silverwood, their first President, to give his experiences as to the manufacture of sulphuric acid. There might be many opinions and points of view as to the desirability or otherwise of having sulphuric acid plant in connection with coking undertakings; but it was an advantage to the Association to be given some direct inside information, instead of depending on outside tales.

Mr. CHRISP then submitted his paper. Having in view the fact that every member had had a copy beforehand, he asked for it to be taken as read. He discussed it in conversational form, and illustrated the chief features of the paper by means of a large number of lantern slides, which gave the members a very clear insight into the details of the subject under review. As to what the President had said about the desirability or otherwise of sulphuric acid plant on a coking works, personally he must admit to being very glad that at his own works was finished, now that the war need had ceased to exist. He thought the most trying time of his life had been during the past four years, when he had had this plant in hand for the Ministry of Munitions. Things generally had been very troublesome and unpleasant for all engaged on the work, and the men had had all sorts of little bodily complaints. These plants might vary; the one he had had was very refractory. Certainly he had gained some valuable experience; and he did not mind saying that he was not anxious for further association with such an undertaking, despite the experience he had gained.

DISCUSSION.

The PRESIDENT said one of the most valuable features of the afternoon perhaps had been the very candid remarks Mr. Chrisp had made with regard to the process. He had mentioned the matter of dust, a feature with which sulphuric acid users, as well as makers, were rather painfully acquainted. With regard to the cascade concentrators, the loss Mr. Chrisp had mentioned was very high, though, from what he (the President) had seen in some plants which he had visited, he should think the figure was not in any way inaccurate, because the atmosphere certainly seemed to be generally almost like fog, and must be very bad to work in.

Mr. J. THORP said that previous to taking up his present work he had had a number of years' experience in the manufacture of acid; and he could endorse all Mr. Chrisp had said about it. One had to absolutely live on the plant, and could never safely leave it. A great handicap was that the gases were only in the chambers for about three hours. If a man neglected his work, there was no nitrous acid going down from the Glover tower; and the three hours was sufficient to turn the plant wrong. Personally, he did not think it was good to work the nitric acid except as a means for pulling round. Being in trouble on his own plant on one occasion, in the hope of gaining some advice, he wrote to Dr. Longley, who had endorsed what he thought was the fault, though he had added that to cure a plant without actually living on it, even with a description of the symptoms before him, was like a medical man trying to cure a patient without seeing him. The chamber process was one which demanded the manager to be there all the time. One might work for six or twelve months without mishap; but if the plant once went wrong, one might be a month before it got right again. In his own experience, there had been times when he had slept for several nights on the floor of the laboratory when things had been going wrong. It was a process which would leave no coke-oven manager any spare time for himself. It was a chemical side of the industry, and be really thought it ought to be left to the chemical manufacturers. One point which did very directly affect the coke-oven manager in his ordinary business was the quality of the acid. People said it was sometimes dirty. His experience was that one might send clean acid away in an apparently clean acid tank, and yet it arrived dirty. This, he thought, would be due to the nitrate being loaded up hot and containing nitre. He had tested the deposit on the bottom of the tanks, and found there was very little lead sulphate. It was mostly ferric sulphate; and he had come to the conclusion that the damage was done in the acid tank through the loading up. His own experience had been got through burning oxide. They had plenty of heat in the burners on the plant; but there was one drawback in oxide that pyrites users had not to meet, and that was that there was a variation in the amount of moisture from various works, and one had to put a little less weak acid down. The oxide was obtained from all sources, and there were various strengths. One could not, therefore, standardize so well as in burning pyrites.

Mr. CHRISP said the only reason he preferred oxide to pyrites was because of its rapid combustible properties. One certainly did have a high variation in the sulphur content; but he thought they experienced very similar variation in using pyrites—one could have it below 40 and up to nearly 50. He had always found oxide more easy to burn, and there was less scarring in the trays, which caused trouble eventually. With regard to the sedimentation of acid in tanks, he had not noticed that nitre had any particular effect upon deposition of dust; but if they had had to load a tank or two of warm acid, an acid apparently clean on loading was dirty in a couple of days' time. His plant had been very well off for Lussac space. Had it not been so, it would have been necessary to have a greater quantity of acid running down, and so have a lower strength of nitre in it.

Mr. H. LAMB asked Mr. Chrisp what (if any) proportion of sulphur was left, as an average figure, in the burnt cinders.

Mr. CHRISP said this depended a good deal upon the fixed sulphur. Where the copper content was low—say, ·4 or ·5 p.ct.—he had had the cinders down to 1·5 p.ct. They had run for months with total sulphur of less than 3 p.ct. Another point to note was the size of the pyrites. If one was using a coarse ore, pieces were liable to pass which were not burnt right through. There one might get as high as 8 or 9 p.ct.

Mr. B. WILSON HAIGH said most of the members, of course, were quite unable to criticize the paper from the scientific point of view; but he thought they would all, as practical managers, be disposed to look with more sympathetic minds on the acid they received at their plants after hearing of the great difficulties under which it was frequently produced. They often got tanks of acid which, when the lids were opened, gave off dense clouds of nitrous fumes; and one was inclined to wonder what effect this sort of thing would have on the lead of the saturators. He had always taken it that it was deleterious; but he had never heard any reliable figures as to what percentage could be considered as safe from causing serious damage to the lead.

Mr. CHRISP said that, prior to taking up his recent work, he had had a similar fear of getting nitrous acid in the saturator. But after having had to deal with acid as he had done for some years, and at the strengths he had had to have it, and keep it in lead tanks, this feeling began to wear off. As delivered, it might contain (say) 1 c.c. of nitre to 1 c.c. of acid. This was a highly nitrous acid, which the makers would prefer to keep at home if possible; but it was the limit the coking manager was likely to get. He would not fear putting it in the saturators after the experiences he had had with hot nitrous acid in thin tanks. He should rather look for faults in the lead for some of the difficulties which arose—zinc or other foreign matter in the lead itself.

Mr. J. W. LEE said he had, unfortunately, had some experience in the manufacture of acid in his youth, very much against his will; and he was very glad when he was able to get back to the laboratory. He could quite bear out what had been said as to the difficulties and unpleasantnesses of working it. His own experience was entirely with spent oxide—fortunately not on a plant where they were buying it, but only using that from their own works, where they had some degree of control over its production. He had lived six miles away from the plant, so the members could imagine that he did not spend much time at home for many months, and he had to spend many a night—not exactly sleeping on the floor, as Mr. Thorp had said—but, at any rate, sleeping in a chair in the laboratory. It was certainly one of the most fickle of chemical processes. Mr. Chrisp had given the meeting a paper which was very valuable, and would serve a useful purpose in the records of the Association.

Mr. LEE, in proposing a vote of thanks to Mr. Chrisp, and also to Mr. Parker, for his assistance with the lantern, said it had always been a fascinating thought to him that the coke-oven industry produced sulphate of ammonia; and it bought sulphuric acid to combine with it. Yet with all their plants they had more than sufficient sulphur in their gases than they needed in terms of sulphur. It made one think that the whole of the sulphur on almost every coke-oven plant was practically going to waste up the chimney; and it seemed a thousand pities that it was so. He believed that the recovery of sulphur from the gases on coking plants was a matter which the future would change very greatly; and he felt sure there would come a time when the sulphur would be recovered and converted into sulphuric acid, though by what process remained to be seen.

Mr. THORP seconded the motion; and it was carried.

Mr. CHRISP hoped that he had not damped the ardour of anybody who had been looking forward to taking up the work of a sulphuric acid plant. There were, of course, plants and plants, and times and times. He had had a rather refractory plant, put together in a period of great and urgent national need. The time during which he had had it had been one of the worst of times. The plant would probably have worked quite well if it had not had to be pushed so greatly for war purposes. The design and material of a plant all had bearing upon its working; but certainly in wartime a sulphuric acid plant was one to keep away from. At the same time, he would not object to taking up a plant again if necessary. He expressed his appreciation of the help of Mr. Parker at the lantern.

Calorific Power Order for Stalybridge.—The Local Government Board have issued an Order which gives the Stalybridge Corporation a calorific standard of 500 B.Th.U.

Sodammonium Sulphate.—In a paper which he read at a meeting of the Yorkshire Section of the Society of Chemical Industry, Dr. H. M. Dawson, B.Sc., explained that the idea of "sodammonium sulphate" as a new fertilizer arose consequent upon the shortage of sulphuric acid during the war. It is formed by the interaction of Glauber's salt with ammonium sulphate at the ordinary temperature, and may be obtained by crystallization from aqueous solutions containing the two sulphates, when the temperature and the relative concentrations are appropriately adjusted. Solutions of the two sulphates obtained by the neutralization of nitre-cake or mixture of nitre-cake and sulphuric acid, may be made to yield Glauber's salt and ammonium sulphate, or may be utilized for the production of sodammonium sulphate. Dr. Dawson stated that the new fertilizer is cheap; the greatest disadvantage being the increased cost of transport. Experiments made with sodammonium sulphate on a small scale have been distinctly satisfactory.

LEGAL INTELLIGENCE.

APPEAL UNDER THE WORKMEN'S COMPENSATION ACTS.

On Jan. 20 the case of Horner *v.* Wandsworth, Wimbledon, and Epsom Gas Company came before the MASTER OF THE ROLLS, Lord Justice SCRUTTON, and Mr. Justice EVE, by way of appeal on the part of the applicant from an award of Judge Harrington, sitting as arbitrator, in favour of the respondents.

Mr. THRESHER, for the applicant, said the short facts were as follows: Plaintiff was employed in the sulphate-house, which was 245 yards distant from the nearest closet. About eighteen years ago there was a closet in close proximity to the sulphate-house; but it was removed, since when a habit had grown up for the men employed in the sulphate-house, when the necessity arose, to relieve themselves in a pail—the contents being afterwards poured into the river. No doubt, the practice was illegal; but the question was whether the illegal act was not due to the failure of the employers to provide a closet in the vicinity of the sulphate-house. On April 4 the applicant, who was on the night shift, on proceeding to empty the pail, fell into the river, and struck his arm against a barge, dislocating his shoulder. The County Court Judge had found: (1) That there was a custom to empty the pail into the river; (2) that the man met with the accident while following the custom; (3) that there was no evidence that the employers knew of the practice; (4) that it was a risky practice, but not so risky as to be unreasonable. On these findings, the award was in favour of the Company. Counsel contended that the award should have been in applicant's favour, as it was clear that it was part of the employment for a man to relieve himself in the natural way during the period of his employment though it was not permissible to do it in an unreasonable place, or to incur unreasonable risks.

Mr. SHAKESPEAR and Mr. VAN DEN BERG, for the respondents, contended that the County Court Judge had not found that the act was reasonable, or that the risk was reasonable. All he found was that the practice was not known to, or acquiesced in by, the employers. This meant that a man doing this thing was doing something which he was not employed to do, unless it could be shown that the employers acquiesced in the act. The accident not having arisen out of, or in the course of, the employment, the decision of the arbitrator ought to be affirmed. An act which contravened an Act of Parliament, as this clearly did (it being an illegal act to put refuse in the river), could not arise out of the employment.

The MASTER OF THE ROLLS said the County Court Judge had found that the accident did not arise out of the employment, and that the practice of emptying buckets into the river was not known to the officials of the Company. But it was said he found that the practice was a reasonable one. It was illegal to foul the river by throwing fœcal matter into it; and his Lordship was satisfied that his Honour did not find as a fact that it was a reasonable thing so to do. All the Judge did was to consider the personal risk the man might run; but that was not a finding that the practice was a reasonable one. The Gas Company had provided closets which could be easily reached by a well-lighted way. The accident could not be said to arise out of the man's employment.

The other members of the Court concurred; and the appeal was dismissed with costs.

UNSUCCESSFUL CLAIM FOR NEGLIGENCE.

At the Greenwich County Court, last Friday week, Charles Lock, an engineer, of Pimlico, brought an action against the South Suburban Gas Company for damages for injuries sustained in an explosion which, it was alleged, occurred owing to the negligence of the Company or their servants in not clearing a main of gas to prepare it for being worked on in safety by the plaintiff.

Plaintiff, giving evidence, said that on Sept. 20 he was engaged in cutting a hole in a gas-main at the Company's works; and noticing that there was gas, he drew attention to it. He was afterwards told that the pipe was ready, the inlet and outlet valves having been shut; and he resumed work. The main was of ⅜-in. steel; and when the piece, which was 14 in. in diameter, had been cut through within about 6 in., an explosion occurred, and plaintiff was badly burned. He was in hospital for a fortnight. He knew there was danger; but he was entirely in the hands of the Company.

Cross-examined, witness said he was a sub-contractor under Messrs. Perry & Co., of Westminster. He had never tackled a gas-main before. Had the pipe been of cast iron, the proper way to cut it would have been by drilling holes close together and cutting through the connecting spaces; but with a steel plate the best way was to cut the hole with a round-nosed chisel. He denied that the foreman had said anything about the procedure to be followed; and he (witness) did not say that it would take too long to drill-out the holes. The foreman did not tell him to be careful not to make a spark.

Mr. *W. R. Pether*, called as an expert, said the gas in the pipe should have been allowed to escape either by taking off a cap, breaking a joint, or taking off a blind flange. He said he did not think that the use of a flogging-hammer would cause an explosion. It was water gas in the main.

Edwin Jones, plaintiff's mate, said that when the plate was nearly cut through, they tried to break it off. They could not manage it, and had to cut a bit more. He was holding the chisel, and at about the second blow the explosion occurred.

Mr. *W. G. Waller*, Chief Foreman, called for the defence, said he told Lock that the safest way was to drill holes in the plate, because, though the valves were shut, there would still be gas; but plaintiff said this would take too long. Witness saw the valves closed by the operator. When he saw Lock and his mate at work with a heavy hammer and a cold-set, he warned them not to cause a spark. He had no idea that it was Lock's first job on a gas-main.

Edward J. Calver, foreman gas operator, said he shut the valves at either end of the pipe, and reported to Mr. Waller, who, in the water-gas house, told Lock in witness's presence that the valves were properly closed, adding: "But mind; the pipe is full of gas. If I were you, I would drill the plate out." After the first hole had been cut, he put his hand on the pipe, and found no pressure of gas. He afterwards found Jones cutting the pipe with a chisel; and noticing that where cut the space was filled with putty, he said "Would it not be better to let the gas escape?" Jones said: "Perhaps it would," and took out the putty. Lock came and asked Jones why the putty was off. Jones replying that witness had said it would be better to let the gas escape, Lock ordered Jones to put it on again. Soon afterwards witness heard loud hammering, and saw Lock and Jones using a flogging-hammer and cold-set. After the explosion, he found the plate still adhering to the pipe, but bent inwardly as if the men had been trying to break it off with a heavy hammer.

Mr. *S. Y. Shoubridge*, Chief Engineer to the Company, said the Company had contracted with Messrs. Perry & Co. to build an additional water-gas plant, to connect it with the existing plant, and to train the staff in the use of the plant. It was not usual to break joints in order to empty pipes; and it was quite easy to make connections by drilling holes, plugging them as drilled, and afterwards cutting out the piece with a hack-saw. A 2-lb. hammer and cross-cut chisel were often used; but a cold-set was not a proper tool. Great force had been used in trying to detach the plate; and no man accustomed to this class of work would have used the flogging-hammer and set. To clear a pipe entirely of gas was extremely difficult; and in practice it was better not to attempt to expel gas by blowing it out with air. The system of drilling holes was employed in making connections with street-mains every day.

Mr. *W. J. Sandeman*, the Distributing Engineer to the Croydon Gas Company, said the operation which had been described was a very simple one. He considered that in shutting the valves the Company did all that was necessary; and it would have been quite contrary to usual practice to have attempted to clear the main. To have removed the caps would, he thought, have increased the risk of explosion.

His Honour JUDGE GRANGER said the facts were against the plaintiff; and the evidence was all one way. There must be a certain degree of danger in all operations connected with gas; but the consensus of opinion was that the method of drilling was the right way. He found, therefore, that there had been no negligence on the part of defendants, and gave judgment for the Company.

Theft of Gas at Coatbridge.

A Spaniard named Jose Mazal, employed as a furnace labourer, appeared at the Airdrie Justice of Peace Court last Thursday on a charge of theft of gas belonging to the Coatbridge Gas Company. It was alleged that on Dec. 3 Mazal connected the inlet and outlet gas-pipes to the main in the road outside his house, and thereby received a supply of gas, consuming at least 1000 c.ft., amounting to 2s. 10d., without payment. Accused, on being asked to state his reason for taking the gas in this way, explained that there was no meter in his house, and he needed the light, so that he had simply annexed a supply, meaning to arrange with the Gas Company when they came round. The prosecutors stated that the Company had cut off the supply from this house, and the accused had himself connected it up again, having evidently no intention of paying for it. The Bench imposed a fine of 20s., or ten days' imprisonment.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 22.]

Nos. 836—1352.

ABRAHAMS, E. G.—"Gas-producers." No. 901.
BAMBER, H. W.—See Abrahams. No. 901.
BATES, J.—"Gasholders." No. 868.
BROUGHAM, L. E.—"Geysers, &c." No. 992.
BYLES, E.—"Gas stoves or heaters." No. 1201.
DAVIDSON, W. B.—"Gas-cleaning apparatus." No. 1267.
GLOVER, R. B. & S.—"Gas-meters." No. 996.
GREENWOOD, H. C.—"Apparatus for detecting and recording small quantities of a combustible gas in gaseous mixtures, &c." No. 890.
LESSING, R.—"Manufacture of sulphate of ammonia." No. 1313.
LINDER, S. E.—See Lessing. No. 1313.
LIVERSEDGE, A. J.—See Davidson. No. 1267.
LOCK JOINT PIPE COMPANY.—"Pipe-joints." No. 1185.
MASSEY, J.—"Incandescent gas-burners." No. 968.
PEARSON, W. H.—"Treatment of shale, &c." No. 1167.
RENNISON, F. T.—"Gas-fired oven furnaces." No. 1308.
ROXBURGH, A. B.—See Byles. No. 1201.
SMITH, K.—"Lighters for gas, &c." No. 1134.
SOUTH METROPOLITAN GAS COMPANY.—"Manufacture of colourless organic compounds." No. 1338.
STANIER, H.—See South Metropolitan Gas Company. No. 1338.
SUTTON, T. C.—"Processes of destructive distillation of coal, &c." No. 1153.
TAYLOR, B. E.—See Smith. No. 1134.
WALKER, J.—See Smith. No. 1134.
ZEALLEY, A. T. S.—See Greenwood. No. 890.

Suggested Gas-Works Purchase at Southend.—The Southend Corporation Gas Committee, being of opinion that economic advantages would accrue to the ratepayers by the amalgamation of the two sources of gas supply in the borough, suggest the appointment of a Special Committee to consider the advisability of the Council acquiring the Southend Gas-Works.

MISCELLANEOUS NEWS.

BELFAST IN DARKNESS.

Strike of Municipal Workers.

The employees in the gas and electricity works of the Belfast Corporation have gone on strike in support of the general movement in the shipbuilding and engineering trades for a 44-hour week. Telegraphing on Sunday, the correspondent of "The Times" said the gas and electricity supplies ceased that day; and as this involves the stoppage of the tramway services, the electric supply for power purposes in mills and factories, and the suspension of the operation of the city bakeries, the majority of which rely on either gas or electric power, the result is that practically the whole city is dislocated.

The employees at the gas-works knocked off work in shifts; and in order to conserve the available gas in the holders as much as possible, it was decided not to have any street lighting on Saturday. Consequently Belfast, which was practically immune from lighting restrictions during the war owing to there being no air raids, experienced its first taste of a pitch-dark night. The accumulated gas ensured a supply until about 1 o'clock on Sunday, when the supply was stopped. The electricity supplies were also stopped, with the exception of two turbine engines, which were allowed to remain working to provide a supply of light for the leading hospitals in the city. This concession was, however, made on the strict understanding that if there was any abuse in connection with this supply by either power or light users on the routes to the hospitals, the supply would be stopped. Twelve men were detailed to attend at the gas-works to keep up the fires under the retorts, and to maintain the plant in order; it being explained that if the retorts were allowed to cool, it would take about a fortnight to have them brought up again to a sufficient heat. There is, however, to be no gas manufactured until the dispute is settled.

It is understood that the Corporation are willing to concede the men the 44-hour working week, but that the employees will not accept it unless the agreement is general and applies to the whole shipyard and engineering industry in the city.

The Directors of the Walker and Wallsend Union Gas Company are recommending to the proprietors the payment of the maximum dividends—namely, upon the preference stocks at the rate of 5 p.ct. per annum, upon the 3½ p.ct. consolidated stock £4 2s. 6d. p.ct. per annum, and upon the 5 p.ct. ordinary stock £5 12s. 6d. p.ct. per annum.

RETIREMENT OF MR. HANBURY THOMAS.

Referring to the retirement of Mr. Hanbury Thomas from the position of Managing-Director of the Sheffield Gas Company, as announced in last week's "JOURNAL," a local correspondent writes: During the 36 years Mr. Hanbury Thomas has been associated with the Company, the undertaking has made remarkable progress, and general regret is felt in the City that, owing to advancing years, he is relinquishing his office. Mr. Hanbury Thomas came to Sheffield in 1882 from the South Metropolitan Gas Company, where he was engaged for twelve years as Assistant under the late Sir George Livesey. He occupied the position of General Manager of the Sheffield Company for many years; but he was eventually appointed to his present berth. In 1882, when Mr. Hanbury Thomas came to Sheffield, the quantity of gas sold was 1,188,117,000 c.ft., while in 1917 the amount sold had reached 5,801,445,000 c.ft. The average price of gas in 1882 was 2s. 3·36d. per 1000 c.ft.; but in 1917, after three years of war, it was 1s. 6·35d. In the year preceding the war it was 1s. 1·21d. per 1000 c.ft.—this being an average figure, and including gas supplied at rates varying from 1s. 5d. down to 10d. per 1000 c.ft. The quantity of coal carbonized at the gas-works in 1882 was 127,888 tons; while in 1917 it was 513,595 tons. The quantity of gas made in 1882 was 9873 c.ft. per ton of coal carbonized; while in 1917 the amount had increased to 11,729 c.ft. per ton. As showing the economical working of the concern under the direction of Mr. Hanbury Thomas, it may be mentioned that while in 1882 the amount required to pay the dividend was 1s. per 1000 c.ft. of gas, in 1917 it was only 3·75d., which included the interest on debenture stock, and the interest to bankers. In 1914, the quantity of gas supplied for power purposes was 664,948,000 c.ft.; but during the period of the war this increased to 909,411,000 c.ft. a year. Numerous improvements have been carried out at the gas-works during this long period of service; and the Company have preferred the horizontal retort to that of the vertical or inclined retort systems. The public and manufacturers of Sheffield have had gas as cheap and efficient as any town in the country.

GAS PRICES AND MINERS' WAGES.

In articles which appeared during the early part of last week, "The Times" dealt with the effect on the price of coal of the miners' new wages demands—the prospect being pointed out of an addition of £40,000,000 a year to the wages bill of the collieries and 4s. a ton to the cost of coal to the consumer, as a result of the miners' programme of a 30 p.ct. advance in wages and a six-hour day.

As to the bearing on the price of gas of this additional burden, "The Times" published the views of a number of representative men in the industry. In 1913, it was stated, the Gas Light and Coke Com-

MAIN D. S. O. FIRES

FOR FUEL ECONOMY.

HYGIENIC AND EFFICIENT.

Made in 55 sizes with a pleasing variety of designs.

Component parts are interchangeable, with Burners reversible, throughout each series.

Special Prices. . . . . Write for latest List.

ORDER NOW WHILE MATERIAL IS AVAILABLE.

R. & A. MAIN, LTD.

WORKS: Gothic Works, EDMONTON, N. 18; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOWROOMS and BRANCHES: 25, PRINCES STREET, OXFORD CIRCUS, W. 1; 82, Gordon Street, GLASGOW; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

pany used 1,988,241 tons of coal; and their price for gas was 2s. 6d. per 1000 c.ft. In 1918, they carbonized 1,861,903 tons; and the price, owing to the higher cost of production, reached the present figure of 4s. 4d. The effect on this price of an increase of 4s. a ton in the cost of coal would be an addition of about 4d. per 1000 c.ft., bringing the price of gas to 4s. 8d. The total amount of gas sold by the Company in 1918 was 26,418,746,000 c.ft. If the additional 4d. were charged on every 1000 c.ft. sold, the total new levy on those who are served by this Company alone with gas for lighting, heating, cooking, and motive power for industry would be just over £440,000. A certain deduction, however, must be made from this figure in respect of the discount which it is customary to allow to large consumers.

In conversation with Sir Hallewell Rogers, M.P. (the Chairman of the Birmingham Corporation Gas Committee), and Mr. A. W. Smith (the Secretary), it was learned that, should the Government concede the miners' demands, it will probably mean an increase in the gas coal bill of £225,000 a year, which is equivalent, approximately, to 5d. per 1000 c.ft. of gas, the present price of which is 3s. per 1000 c.ft. In Manchester, the calculation is made that the 30 p.ct. increase of miners' wages will increase the cost of coal by 4s. a ton, and the coal bill of the Manchester Corporation Gas Committee by nearly £100,000 a year. A necessary consequence will be an increase in the price of gas of from 4d. to 6d. per 1000 c.ft., to be added to the 1s. 4d. rise which has been authorized since the war began. Alderman Ball (the Chairman of the Nottingham Corporation Gas Committee) pointed out that every 1s. per ton on the price of coal means an addition of £10,000 to the expenses; while Mr. P. S. Hoyte (the Engineer and Manager of the Plymouth Gas Company) declared that, if the demands are granted, the cost of gas to the consumer must be further increased by from 3d. to 5d. per 1000 c.ft. No economies in the cost of gas manufacture can be set off against such an enormous increase in the cost of the raw material as the miners now propose to bring about.

SPALDING GAS-WORKS IMPROVEMENTS.

Towards the end of last year, Spalding was being supplied with a strictly limited amount of gas; but in place of the letters of complaint, both as to quantity and quality, which were then received at the works, there are now congratulations upon the improved condition of affairs which the Manager (Mr. H. Blakey) has succeeded in bringing about.

The shortage was due to the fact that the vertical retorts were idle, and the four beds of horizontal retorts available were not capable of producing sufficient gas to meet the demands. This state of affairs has been so altered that, at the present moment, more gas is being made than is required.

As long ago as last May, the work of getting the vertical retorts into good order was in progress; and this was completed, and the retorts in operation, three days before Christmas. The make per ton has greatly increased; and the gas is declared to be of a far superior quality. At the moment, indeed, the consumption of gas in the town is not sufficient to keep the verticals fully employed. In addition to being repaired, they have been brought thoroughly up to date, and are fulfilling all expectations. As a result of the recent expenditure of money upon these retorts, they are, with proper care and good workmen in attendance, expected to last for a few years, and with the increased quantity of gas per ton produced, together with the decrease in working expenses, it is anticipated that the outlay will be repaid in about half the time the retorts will last.

Now that they are in a position to supply this increased quantity of gas, the department are particularly anxious to encourage consumption by gas engines, cookers, fires, and, in fact, all appliances using gas.

SELECT COMMITTEE ON TRANSPORT.

Reports and Evidence.

A few days ago there was published as a Blue-Book the proceedings and minutes of evidence taken by the Select Committee who were appointed last August for the purpose of considering what steps, if any, it is desirable to take to develop and improve the internal facilities for transport within the United Kingdom, to secure effective supervision and co-ordination, and to ensure that such developments and improvements shall be adequate and suitable to meet the national requirements.

The evidence is preceded by the two reports of the Committee. In the first of these the Committee recommend the carrying out of certain work in connection with Irish waterways, and the establishment as soon as possible of a Government Harbour Department. The second report is a much longer document; and in it the Committee deal separately with railways, canals, road transport, harbours and docks, and other transport agencies; organization and management; Government supervision and regulation of the transport system; and improvements and extensions. From a purely technical point of view, it appears to the Committee to be desirable that there should be a unification of ownership—not merely unification of management—of the main railway systems, if the question of the improvement and development of the internal transport facilities is to be considered from the standpoint of efficiency and economy, and with due regard to the interests of the proprietors, the railway staffs, and the general community. The Committee, in the absence of additional evidence which they desired to take, have not been able to come to any conclusion in regard to the most advantageous organization for dealing with the canals, except that further amalgamation would be beneficial. They recommend that the possibility of improvement of the canal system should be considered further by a Select Committee on Inland Transport. The total extent of canals and navigations in the United Kingdom is about 4670 miles. While they do not consider that road transport generally is susceptible of being organized to an extent comparable

USE Simmance's

DEAD BEAT INDICATORS

instead of WATER-TUBE GAUGES and

"READ THE PRESSURE BY THE POINTER."

No liquid to evaporate and no levels to adjust.

No glasses to break and nothing to clean.

Direct reading, Open scale, Any range (Pressure, Vacuum, or Combination).

Incorrodible, Accurate, for foul or purified gas.

MADE IN MANY RANGES WITH TABLETS LETTERED AS DESIRED.

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER.

Agents: Australia—FYVIE & STEWART, 360, Collins St., Melbourne; Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

The "ADVANCE"

opens the way to

Success in 1919.

WILSONS' "Sixteen Points"

settle the question that this is the most improved and complete **Gas Cooker.**

Point No. 5 OVEN DIVIDED—For varied cooking, Oven can be divided into three compartments of different heats.

,, No. 6 OVEN QUICKLY HEATED—Oven casings of scientific and novel construction—no slag-wool used.

,, No. 7 OVEN NOT LATCHED—Door held with spring catch; easy movement and practically a safety valve in emergency.

,, No. 8 OVEN DOME—Easily removable and flue space readily and thoroughly cleaned.

(See further points in next advertisement.)

SOLE MANUFACTURERS AND PATENTEES:—

WILSONS & MATHIESONS, LTD.,

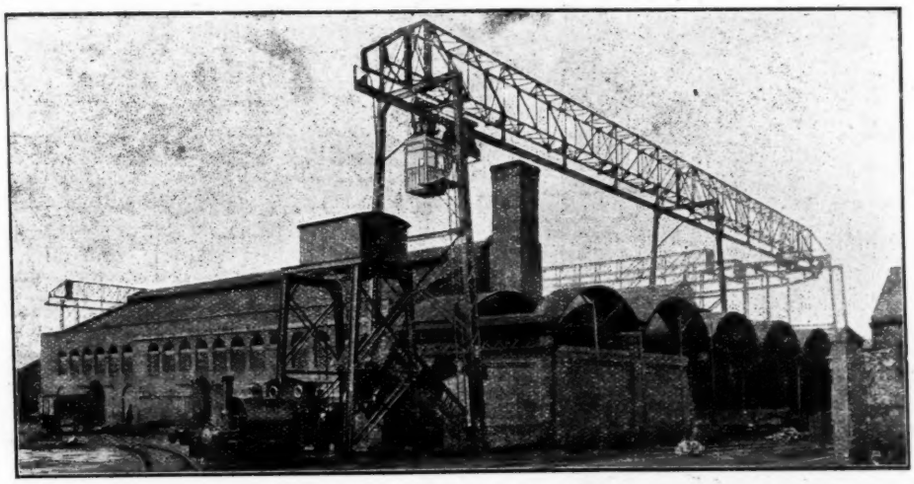
London Office:
76, QUEEN STREET, CHEAPSIDE, E.C.

Carlton Works, Armley, LEEDS.

STRACHAN & HENSHAW, LTD., BRISTOL.

Telegrams: "STRASHAW, BRISTOL."

TEL. 432.



SPECIALITIES.

TELPHER CONVEYORS
FOR COAL, COKE, OXIDE, &c.,
AUTO. SKIP FILLERS, AND TRUCK TIPPERS.

SPECIALITIES.

Britain's Best Mantle

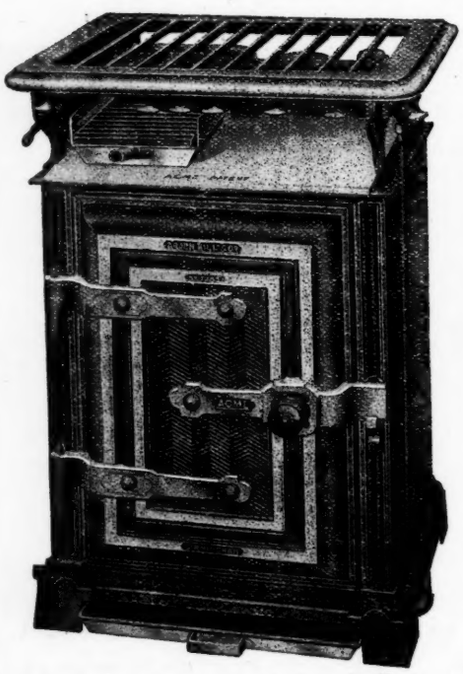
IS THE

VOLKER

The All-British Production of an All-British Company

The VOLKER LIGHTING CORPORATION, Ld.
Garratt Lane, ——— LONDON, S.W. 18.

THE IDEAL GAS-COOKER FOR HOUSEHOLD USE.



ARDEN HILL & CO.'S

"SUPER-ACME" GAS-COOKERS

EMBODY ALL LATEST IMPROVEMENTS, GIVE HIGHEST EFFICIENCY, AND ARE MAINTAINED AT QUITE A LOW COST.

THEY ARE PORCELAIN-ENAMELLED INSIDE AND OUT. THE OVEN IS OF EXTRA-LARGE CAPACITY. THE GAS TAPS ARE PLACED AT THE FRONT AND THEREFORE EASILY ACCESSIBLE. EXTRA SPACE BEHIND THE OVEN GATES ENSURES PERFECT VENTILATION AND UNIFORM HEAT. HOT PLATE IS HINGED, AND WHEN IT IS RAISED THE BURNERS CAN BE EASILY CLEANED.

PLACE YOUR ORDERS EARLY TO ENSURE DELIVERY WHEN REQUIRED.

Full particulars of sizes and prices on application to the Makers,—

ARDEN HILL & CO.,
"Acme" Works • BIRMINGHAM.

with that which may be reached in connection with transport by railways and canals, they believe that there is much useful work to be done. In view of the improbability of aerial transport being available upon any considerable scale for many years to come for the internal transport of passengers and goods, the Committee have made no inquiries in regard to it.

In all thirteen witnesses were examined, the first of whom was Sir William Marwood, K.C.B., Joint Permanent Secretary to the Board of Trade, who explained the powers of control now possessed by his Department.

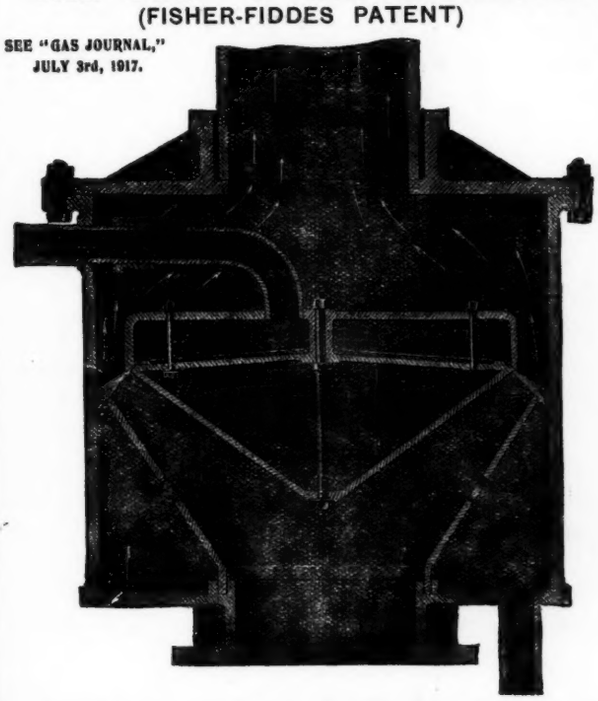
He was followed by Sir Maurice Fitzmaurice, the Chairman of the Canal Control Committee, who said that the total mileage of the important waterways in this country is 2500 miles, of which 1226 miles (belonging to 26 canal companies) are under the control of his Committee. Works and improvements in connection with certain routes which were proposed by the Royal Commission on Canals, would, he estimated, now cost, if carried out on the basis of a through service of 100-ton barges, £44,000,000. This scheme would deal with the canals extending from Birmingham and Leicester to London; from Wolverhampton and Birmingham to the Mersey; from Wolverhampton and Birmingham to the Severn; and from Leicester and Nottingham to the Humber. These would be vested in a Waterway Board for Great Britain. The sum named included £6,000,000 for the acquisition of the waterways, and another £10,000,000 for the provision of inland harbours or wharves, warehouses, and other facilities. Questioned as to the Aire and Calder Canal, witness explained that their principal business is coal. They carry coal in what they call compartment barges. They have nineteen barges, each carrying 40 tons of coal. These barges go down in a train, all connected, and are taken by one tug down the canal. Each barge is then taken separately under what is practically a floating elevator. The elevator is sunk; and the barge floats over it, and is lifted, and the coal tipped into the bunkers of the ship. In this way the coal is delivered into the bunkers of the ship at about one-half the cost for carriage that the railways can deliver it. The coal is generally loaded by being shot into the barge at the side of the canal; but at one place the barges are lifted out of the canal, and taken inland on a railway, and the coal is put into the barge direct from the colliery-tip. Then the barge is run down again to the water. He thought the whole cost of carriage was considerably less than one-halfpenny per mile. The same thing is done every day in the way of lifting boats, instead of having locks. Barges carrying 40 tons of mixed goods are lifted from the Weaver Navigation into the Trent and Mersey Navigation, and *vice versâ*.

Asked whether, if the ambitious scheme of the Royal Commission were not carried out, a proposal could be made of a less extensive character, which would not provide a canal system on the same scale as contemplated by the Commission, but would yet make available at considerably less expense the present system of canals, and render them much more efficient, witness said he thought minor alterations could be made; but he had two important suggestions to offer in the way of improvements. First, to get an increase in the speed with which things can be carried on canals. To this end, there must be fewer locks, and boats with some kind of mechanical propulsion. The moment a speed of 3 miles an hour was exceeded, it was necessary to renew the banks of the canals with stone, as otherwise they would not stand the wash. The present canals could be very easily improved. If the canals were made large ones, as suggested by the Royal Commission, there would be a demand for long hauls and through routes. Before the war, the greater portion of the traffic of the country on canals was coal traffic—principally in the Birmingham district, where there were carried about 7,000,000 tons a year, as short distance traffic, and at least seven-eighths of this was coal traffic. The recommendations of the Royal Commission were very largely based on catering for a big increase in the coal traffic. His attention had been called to a proposal which had been made that canals should be drained, and that they should be used for traffic by a light electric railway; but it was the most silly proposal he had ever heard of—especially for an electric railway, which one always aimed at keeping away from water. Obviously a depression is not the place in which to put an electric railway. Many of the canals pay a dividend at the present time. What should be done was to take one of the routes from Birmingham, carry out as quickly as possible the improvements suggested by the Royal Commission, and then see the effect before spending money on the other routes. He had never actually gone into the comparison, but it was obvious that if they had canals like those on the Continent, canal transport was infinitely cheaper than by rail. On the Continent there is an average of one lock for every two miles, whereas in this country there is an average of one lock for less than a mile. If there had been good canals here during the past three years, it would have been of very great value to this country.

Sir Herbert Walker, K.C.B., General Manager of the London and South-Western Railway Company, and Acting Chairman of the Railway Executive Committee, dealt with the control of the railways, and what has been done during the war. He remarked that the Coal Controller, when he was first appointed, got out a scheme to confine as far as possible the consumption of coal to the districts in which it was produced; and this, no doubt, helped the railways very considerably. But his efforts were all counterbalanced by other large traffics that the railways had to carry over very long distances. Then, over 30,000 railway-owned wagons and a large number of privately-owned ones, as well as a considerable number of locomotives, were sent to the various theatres of war. As to the common user of goods wagons, all open trucks were thrown into a common pool and used regardless of the company to whom they belonged or the normal homeward direction. This common user pool embraced 394,000 wagons. Arrangements were also made under the Defence of the Realm Regulations to enable the companies to load back in their homeward direction privately-owned wagons. The owner was given a shilling a day for the use of his wagon. In many cases, traders got their wagons back just as quickly as before. It would undoubtedly be a good thing to have a standardization of wagons, so that they could run on all lines. But this was a big question. They had first to get a standard gauge,

"TAR FOG" & TAR EXTRACTOR
(FISHER-FIDDES PATENT)

SEE "GAS JOURNAL," JULY 3rd, 1917.



FOR THE
ELIMINATION OF
TAR & TAR FOG
FROM COAL GAS AND
OIL VAPOURS
FROM C.W. GAS
WHY NOT TRY THE
NEW METHOD

AUTOMATIC
EFFECTIVE &
INEXPENSIVE

PARTICULARS AND PRICES FROM

R. & J. DEMPSTER, LTD., MANCHESTER.

Temporary London Office: BLENHEIM MANSIONS, BROADWAY, WESTMINSTER, S.W. 1.
London Office Telephone No. Vic. 7426.

a standard permanent way, and a standard strength of bridge. Privately-owned wagons numbered about 650,000; and there were some 750,000 railway companies' wagons—making a total of 1,400,000. The former were chiefly built for a specific traffic of their own; and this makes it difficult to use them for general purposes. Looking upon the railways as a whole, the permanent pooling of wagons would very probably be an advantage. Between the railway companies themselves, the pooling of their own wagons has been a difficulty with regard to repairs. So far as privately-owned wagons are concerned, they present very great difficulties; and the pooling cannot be done without legislation. But, he added, there is no doubt that the use of private-owners' wagons on the railways in this country is a very great nuisance, and a tremendous source of expense. The companies would be far better without them, even if they had to come under severe obligations with regard to finding wagons for the purpose.

Evidence on the question of train ferries was then given by Sir Francis Dent, the General Manager of the South-Eastern and Chatham Railways, and a member of the Railway Executive Committee. He said he thought that, where an efficient railway paralleled an efficient canal, the railway would be certain to beat the canal. In this country, canals could not flourish without protection or subsidy. A channel ferry could not possibly compete with a direct steamer as regarded perishable goods, as well as general goods; a tunnel would be a considerably cheaper proposition. There would be a very great increase of traffic in the event of a channel tunnel being constructed. Rather than run a train ferry, he would prefer to see the money spent on improving the harbours.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 27.

There is not much business being done in the London tar products market; but prices generally are quietly firm. Pitch is in a strong position. Makers are comfortably sold, and a price over 65s. per ton is obtainable. Benzol continues to find good outlet as a motor spirit. There is little demand for solvent naphtha at the moment; the price being from 3s. to 3s. 3d. per gallon. Creosote is called about 6d. to 6¼d. per gallon net in bulk at makers' works. There is a moderate demand for pyridine bases; the price of from 4s. to 4s. 3d. per gallon being quoted.

In sulphate of ammonia, there is nothing further to report.

Tar Products in the Provinces.

Jan. 27.

The average values for gas-works products during the week were: Gas-works coal tar, 30s. 6d. to 35s. 6d. Pitch, East Coast, 44s. to 45s. per ton; West Coast—Manchester 37s. 6d. to 40s., Liverpool 37s. 6d. to 40s., Clyde 37s. 6d. to 40s. nominal. Benzol 90 p.ct., North, 1s. 10d. to 1s. 11d.; 50-90 p.ct., naked, North, 1s. 7d. to 1s. 8d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 2s. 10d. to 2s. 11d. Heavy naphtha, North, 2s. 11d. to 3s. Creosote, in bulk, North, 4¼d. to 4½d. Heavy oils, in bulk, North, 5d. Naphthalene, £25 to £30; salts, £6 to £7, bags included. Anthracene, "A" quality, 4d. to 6d. per minimum 40 p.ct.; "B" quality, 1½d. to 2d.

Manchester District Tar Prices.

The average price realized for tar in the Manchester district, based on the value of the products, for the month of December was £2 5s. 5d. per ton.

FROM A MARKET CORRESPONDENT.

Tar Products.

Taken generally, conditions of business in the tar products markets show very little alteration. The volume of trade indicates signs of increasing; and it is satisfactory to note that outputs also are expanding. The easier tendency of heavy and solvent naphthas, to which attention has been drawn in recent reports, still continues; and prices are again easier. Crude naphtha, however, is unchanged. Cresylic acid is lower on increased offerings, and carbolic acid also is weaker, especially crystals, which are no better than 1s. 1d. per lb. Even at this price, however, there must be a good profit on production, notwithstanding that crude 60's remains at 3s. 6d. per gallon. Business in benzol is developing quite satisfactorily—motorists taking to the fuel in many large instances in preference to petrol; and it is quite likely that in the near future there will be a further readjustment of values, bringing benzol prices nearer those for petrol. As a matter of fact, if thermal value counts for anything, benzol should be the dearer. Toluol has slipped back slightly, which renders it more attractive to the dye interests, whose chief concern at the moment seems to be the proper supply of intermediates at the correct price, without which the British interests cannot hope to satisfactorily withstand foreign competition. Tar is without much change, and creosote is in practically the same position. Pitch, however, has shown an increasingly strong tone, and values have materially advanced at all ports. Other tar products remain unaltered, and call for no special comment.

The range of quotations is as follows:

Benzol: 90% London, 2s. per gallon; 50-90%, 2s. per gallon.

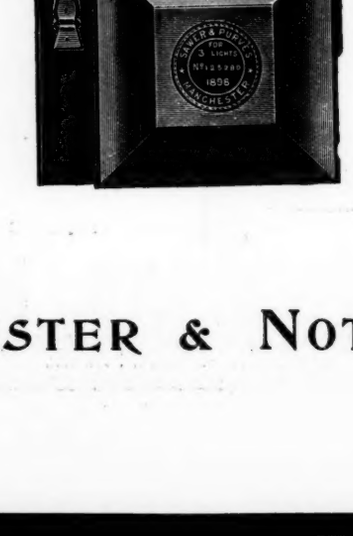
Carbolic Acid: Crude 60's 3s. 6d. per gallon; crystals 40% London 1s. 1d. to 1s. 2d. per lb.; provinces 1s. per lb.

Crude Tar: London 39s. to 41s.; Midlands 33s. to 35s.; North 32s. to 34s. per ton *ex* works.

Pitch: London, 67s. 6d. to 70s. per ton; East Coast, 47s. 6d. to 50s. per ton; West Coast 43s. to 44s., with Manchester 40s. per ton and Glasgow 47s. 6d. per ton; South Wales, 48s. per ton.

SAWER & PURVES,

THE POSITIVE DRY PREPAYMENT METER



MANCHESTER & NOTTINGHAM.

Solvent Naphtha: London 2s. 9d. to 3s. Provinces average 2s. 8d. per gallon.
Crude Naphtha: Naked 1s. 1d. per gallon.
Heavy Naphtha: 2s. 9d. per gallon.
Naphthalene: Refined £28 per ton nominal; salts 80s., bags included.
Toluol: Naked, 3s. 4½d. per gallon nominal.
Creosote: Nominal, London 4¼d.; North 4d. to 4¼d. (Government price, 75s. per ton f.o.b.—equal to 4⅛d. per gallon); heavy oil, 4⅛d. per gallon in bulk.
Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1¾d. to 2¼d.
Cresylic Acid: London, 3s. 3d.; Provinces, 3s. per gallon.
Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

The position remains without much alteration, except that rather more is being released for export, although so far very little of the amount exported is going to other than Allied countries. The sooner the export restrictions can be relaxed the better, as the risk of losing for good and all our pre-war markets abroad must not be lost sight of. Take, for example, the situation as regards Japan. In 1913 that country imported 110,634 tons of ammonium sulphate, as against 14,980 tons in 1917—all of which was utilized for agricultural purposes. In 1913, Japan produced only 7402 tons of ammonium sulphate; but by 1917, the home production had increased to 53,000 tons. In addition, there was produced in Manchuria 3462 tons of ammonium sulphate in 1916, and 10,178 tons in 1917. The South Manchurian Railway produces 5400 tons from its Mond gas plant, and the Dalny Ammonium Sulphate Company recovers about 250 tons from organic manure. When certain works now in course of erection are completed, the total production of ammonium sulphate in Japan is expected to exceed 100,000 tons per annum. In other words, the whole of the annual pre-war import of sulphate from Great Britain has been replaced, and our market there would seem to have disappeared. The output of bye-product ammonia in 1917 was 12,900 tons—3000 tons from gas plants, 7200 tons from coke-ovens, and 2700 tons from Mond gas plant. Most of the numerous coke-ovens erected since 1914 are of the beehive type; but abundant ammonia should soon be available from the rapidly expanding coke industry in connection with iron smelting. The position in Japan is typical of developments in other parts of the world during the past five years, and gives some idea of the problems to be faced by the manufacturer of sulphate.

The Yorkshire Colliers' Strike.

The big strike of Yorkshire colliery workers last week threatened serious consequences at the gas and electric works all over the industrial West Riding, where stocks of coal were very low owing to the general coal difficulties. In both industries committees and managements held consultations to consider the position, and there was every prospect of the issue of public notices of curtailment of service when the strike was suddenly ended after only a little over a day's duration. At Heckmondwike, the effect was immediate; the gas supply being cut off for a portion of the day, and leaving many works in other industries which depend on gas power in a quandary. The Leeds and Bradford gas undertakings, being not wholly dependent on Yorkshire supplies, as are most of the general industries, were prepared to carry on for a week or two, and might even have been able to help some of the factories by supplying coke breeze. Huddersfield, too, might have managed for two or three weeks. The Keighley Gas-Works had only about a three days' supply of coal; Otley expected to be able to continue for a week, especially if local work ended with the end of daylight; Mirfield, which supplies also Ravensthorpe and Hartshead, hoped to continue until to the week-end; Skipton could maintain supplies for a fortnight without reducing pressure; Shipley's supply would have ended in about three days, the stock of coal being so short that the pressure had been reduced a week before the strike. The Guiseley Company, who supply also Yeadon, part of Rawdon and Menston, had about a week's supply of coal; there being considerable scope for reduction in lighting, as the reduction is only 7 or 8 p.c. on that of pre-war days and only 2 p.c. on that of last year. Ilkley expected to be able to continue for about three weeks.

Price of Gas to the Leigh-on-Sea Works.—The Town Clerk has reported to the Southend Gas Committee that he has received a communication from the Southend Gas Company stating that they had been compelled by the Coal Controller to accept emergency coal at an increased price, averaging 11s. 5d. per ton above contract prices, representing 11½d. per 1000 c.ft. of gas produced, and requesting that the Corporation would pay them for the gas purchased in bulk by the Leigh Gas-Works during the period that the emergency coal was being used—viz., Dec. 13 to 28—an additional sum of 11d. per 1000 c.ft. It was resolved that the request of the Company be acceded to.

Quality of Gas at Warrington.—A Special Sub-Committee who were appointed by the Gas Committee to inquire into the working of the Warrington Corporation gas undertaking, point out, on the subject of complaints as to the poor quality of the supply, that many of the difficulties have arisen in consequence of the shortage of coal, largely due to the action of the Coal Controller in diverting supplies. Another factor is the unduly large proportion of unskilled labour which has had to be relied upon since more efficient workers were called to the colours. An important recommendation of the Sub-Committee is that the services of a consulting engineer should be retained to advise as to the remodelling and extension of the gas-works. It is proposed that a water-gas plant should be laid down immediately, to provide ready means of augmenting the supply for next winter. An extension of the gas-making plant should, it is urged, be undertaken, so as to be in operation for the winter of 1920. The Sub-Committee state that it was proposed to make considerable extensions immediately prior to the outbreak of war; but owing to restrictions of capital expenditure and the difficulty of obtaining machinery, the matter was held up.

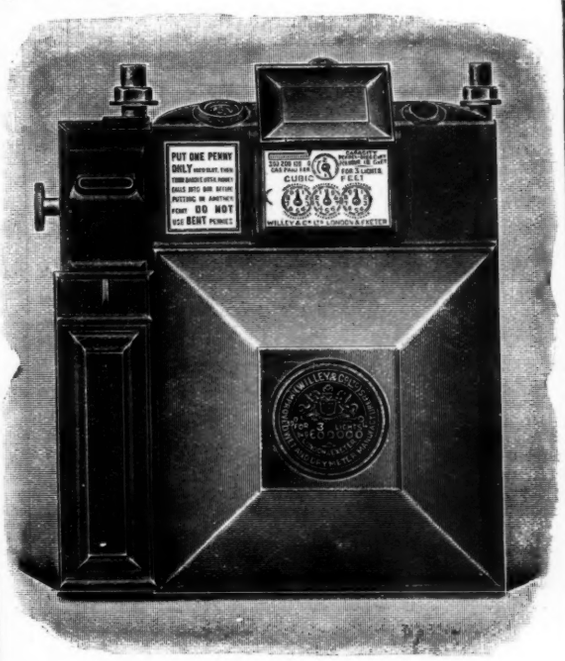
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD.,
Exeter, London, Manchester, Leicester.

Telegrams:
"WILLEY, EXETER."
"GASVILLADO, KINLAND, LONDON."
"METERS, LEICESTER."
"WILMETER, MANCHESTER."

Telephone Nos.:
182 EXETER.
224 DALSTON, LONDON.
4777 LEICESTER.
7419 CITY (MANCHESTER).

LONDON WORKS & OFFICES:
89-95, Hertford Road, Kingsland, N.
LEICESTER:
5, Oxendon Street.
MANCHESTER:
John Street, Booth Street West, S.W.

AGENTS FOR SCOTLAND:
D. M. NELSON & CO., 20, WEST CAMPBELL ST., GLASGOW

Tinplate Prices.—The Minister of Munitions has issued a detailed statement of maximum prices and provisions in regard to tinplates and terneplates which have been, as from Dec. 1, 1918, substituted for those contained in a notice dated Aug. 24, 1917.

The Task of Reinstatement.—The Employment Exchanges, assisted by the Local Advisory Committees, which represent equally the interests of both parties in every neighbourhood, have the organization for the reinstatement of men in civil life on demobilization ready for use. The staffs of the Exchanges have been considerably strengthened, in order to meet the extra strain thrown upon them. It is not generally known that branches have been set-up to deal with discharged men only; and in a great number of cases special sections for disabled men have been established. As far as possible, the work in these new additions to the Exchange system is carried on by men in the same position as those whom they are helping back to civil employment. Discharged men, with no small proportion of disabled among them, superintend the placing of discharged and disabled men. It has been found that the loss of an arm, of a leg, of two legs, and even of eyesight, is no insurmountable obstacle to the performance of efficient work—given employers who will employ the men.

Stockport Gas Accounts.—The accounts of the Stockport gas undertaking for the year ended March 31 last (which are signed by Mr. Harry Grundy, the Borough Treasurer) show that the income on revenue account was £171,209, and the expenditure £158,663. This left a balance of £12,545 to be carried to the profit and loss account. The sinking fund, redemption fund, and interest charges amounted to £19,210, which made a loss on the year of £7369, to which had to be added a deficiency on the working of the previous twelve months of £4432.

New Gas-Works for Port Glasgow.—The Port Glasgow Town Council, by a majority of nine votes to three, have agreed to proceed with the erection of new gas-works on the ground at Fyfe Park recently acquired by them. The site is an excellent one, distant only a mile to the east of the town. It is estimated that the outlay on buildings and plant will be £60,000. A discussion took place as to the voting of a sum to Mr. G. P. Mitchell, the late Gas Manager, for services rendered in drawing up a report, preparing ground plans, &c., for the new work at Fyfe Park. Some of the members suggested £30. By a majority, however, it was agreed that Mr. Mitchell's services were worth £50; and it was agreed that this amount be paid.

STOCK MARKET REPORT.

THE week just closed on the Stock Exchange was one of chequered progress, which was disappointing after the happy career of the week before. It opened full of strength and fairly active, but very soon encountered a set-back upon the announcement of Mr. Chamberlain's scheme for a new issue of National War Bonds, which was severely criticized in financial circles. Coupled with this was the dark prospect of labour troubles of unmeasurable magnitude. So the mid-week was much depressed. Ere the close, however, calmer views in regard to the Bonds, and something achieved towards labour placation, induced a better feeling.

The gilt-edged market was dull in view of War Bond competition, and Home Government issues fell; but by Friday they had made some recovery—the 5 p.ct. Loan reaching 95 1/16 and Consols 59 1/2. Home Rails had a bad week, and Canadians and Argentines were flat.

Business in the Gas Market was fully as active as in the week before, perhaps a shade more so, and a good number of undertakings were in action. There were movements both ways in quotations; but, on the whole, the general tendency of prices was steady. Gas Light ordinary was rather easier in view of the approaching dividend at the authorized rate of 3 p.ct.; but the preference stock rose a point. Imperial Continental and Primitiva were unchanged; but Continental Union was easier. Aldershot and Tottenham debenture rose.

Bargains done for cash during the week were as follows: On Monday, Bombay 5 7/8, Commercial 4 p.ct. 65, Continental Union 49 1/2, ditto preference 72, 74 1/4, Gas Light ordinary 73 1/8, 73 1/4, 73 1/2, 73 3/4, 74, 74 1/4, ditto maximum 57 3/4, Imperial Continental 118 1/2, 118 3/4, 119, 119 1/4, 119 1/2, 119 3/4, ditto debenture 72 1/2, Primitiva 35s., 37s. 6d., ditto preference 62s. 6d., 65s., South Metropolitan 75 1/2, 76, Wandsworth "A" 92 1/2, ditto "B" 73, ditto debenture 50. On Tuesday, Commercial 4 p.ct. 65, 65 1/2, ditto 3 1/2 p.ct. 61 1/2, ditto debenture 52, Gas Light ordinary 73 1/2, 74, 74 1/4, 74 1/2, Imperial Continental 118 1/2, 119, 119 1/2, ditto debenture 72 1/2, Primitiva 36s. 10 1/2d., ditto preference 62s. 6d., Sheffield "C" 168, South Metropolitan 75 1/2, Wandsworth "A" 93 1/2, Barnsley £10 9s. 6d. On Wednesday, Brighton and Hove original 140 1/2, British 32, 32 1/16, Commercial 4 p.ct. 65 1/2, Continental Union 50 1/2, ditto preference 73, European 13 1/4, Gas Light ordinary 73 1/4, ditto preference 70, 70 1/2, 71 1/2, ditto debenture 56 3/4, 57 1/2, Imperial Continental 118, 118 1/2, 119 1/4, Lea Bridge 95, Monte Video 9 3/4, 9 1/2, Primitiva 35s., 35s. 3d., 37s. 4 1/2d., 37s. 6d., ditto preference 63s. 9d., 65s., South Metropolitan 75 3/4, ditto debenture 54 3/4, Tottenham debenture 63 1/2. On Thursday, Brighton and Hove original 141 1/2, British 31 3/4, Continental Union 50, Gas Light ordinary 71 3/4, 72 1/2, 72 3/4, 73, ditto maximum 57 3/4, ditto preference 71, Imperial Continental 118 1/2, 119, ditto debenture 72 1/2, Lea Bridge 95 1/2, Newcastle 73, Primitiva 35s., 36s. 10 1/2d., 37s. 6d., ditto preference 63s., 63s. 1 1/2d., South Metropolitan 75, ditto debenture 55 3/4, South Suburban 79, Brighton and Hove preference "B" 95. On Friday, Bournemouth "B" 11 1/16, 11 1/8, Brighton and Hove original 140 3/4, Buenos Aires 52, 52 1/2, European 13, Gas Light ordinary 71 1/2, 71 3/4, 72, ditto preference 71, ditto debenture 57, 57 1/2, Imperial Continental 117 1/2, 118, 118 1/2, 119, Primitiva 37s. 6d., ditto preference 63s. 9d., South Metropolitan 75 1/2, South Suburban 78 1/2, Hampton Court 70, 70 3/8, Danish 9 3/8, 9 13/32, 9 1/4.

The Money Market was firm. The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Shares.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
189,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	62–67	..
1,551,868	"	April 8	3 1/2	4 1/2%	Alliance & Dublin Ord.	59–64	51–56	..
874,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76–79	61–63*	..
280,000	5	April 29	7 1/2	8%	Bombay, Ltd.	5 1/2–6 1/2	5 1/2–6 1/2	5 1/2
50,000	10	Feb. 26	16	11%	Bournemouth Gas and Water { 10 p.c.	26–30	22–24	..
868,110	10	"	7	7%	B 7 p.c.	15–15 1/2	10 1/2–11 1/2	11 7/16–11 1/2
115,000	10	"	6	6%	Pref. 6 p.c.	13 1/2–14	9 1/2–10 1/2	..
159,740	—	—	—	4%	4 p.c. Deb.	..	66–68	..
992,045	Stk.	Feb. 26	14	14%	Brentford A Consolid.	261–266	78–81	..
784,920	"	"	11	11%	Do. B New	204–209	72–77	..
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109–111	77–82	..
221,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91–98	62–64	..
317,880	"	Feb. 26	11	8 1/2%	Brighton & Hove Orig.	208–212	140 1/2–141 1/2	140 1/2–141 1/2
244,300	"	"	8	5 1/2%	Do. A Ord. Stk.	154–159	97–102	..
983,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
880,000	20	Mar. 26	12 1/2	22/8	British	44–45	31 1/2–32 1/2	31 1/2–32 1/16
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88–90	64–66	..
245,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	55–57	50–53	52 52 1/2
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1 1/2–2 1/2	3 1/2–4 1/2	..
100,000	10	—	—	4 1/2%	Do. 4 1/2 p.c. Pref.	4–6	7 1/2–8 1/2	..
100,000	Stk.	June 26	4 1/2	4 1/2%	Do. 4 1/2 p.c. Deb. Stk.	70–75	60–65	..
157,150	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108–110	79–81	..
1,518,380	"	Feb. 19	5/9/4	36/-	Commercial 4 p.c. Stk.	106–108	62–67	65–65 1/2
860,000	"	"	5 1/2	30/-	Do. 3 1/2 p.c. do.	103–105	58–63	61 1/2
475,000	"	June 11	8	8%	Do. 3 p.c. Deb. Stk.	69 1/2–71 1/2	51–53	52
600,000	"	"	4	—	Continental Union Ltd.	76–79	48–53	49 1/2–50 1/2
300,000	"	"	7	—	Do. 7 p.c. Pref.	115–118	70–75	72–71 1/2
51,600	Stk.	Aug. 29	14 1/2	13 1/2%	Croydon A 10 p.c.	..	160–170	..
278,400	—	"	11 1/2	10 1/2%	Croydon B and C 7 p.c.	..	135–140	..
492,370	Stk.	—	6	6 1/2%	Derby Con. Stk.	128–126	95–100	..
55,000	"	"	4	4%	Do. Deb. Stk.	102–104	80–88	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17 1/2–18	13–14	13–13 1/2
15,398,975	Stk.	Feb. 10	4/17/4	99/4	Gas Light and Coke { 4 p.c. Ord.	98–102	71–73	71 1/2–74 1/2
2,600,000	"	"	8 1/4	8 1/2%	3 1/2 p.c. max.	76–79	56–54	57 1/2
4,069,325	"	"	4	4 1/2%	4 p.c. Con. Pref.	90–99	70–72	70–71 1/2
4,074,850	"	June 11	8	8 1/2%	3 p.c. Con. Deb.	72 1/2–74 1/2	56 58	56 1/2–57 1/2
180,000	"	"	10	10%	10 p.c. Bonds	..	..	..
89,600	"	Mar. 12	5	4 1/2%	Hastings & St. L. 5 p.c.	..	60–65	..
268,740	"	—	3 1/2	2 1/2%	Do. 3 1/2 p.c.	87–89	45–50	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16 1/4–16 1/2	7 1/2–8 1/2	..
86,600	Stk.	Sept. 12	9	9 1/2%	Hornsey 7 p.c.	..	117–122	..
181,000	"	Mar. 12	7 1/2	6 1/2%	Ilford A and C.	151–154	92–97	..
65,780	"	"	6 3/8	4 3/8%	Do. B	115–118	70–75	..
65,600	"	June 26	4	4%	Do. 4 p.c. Deb.	92–94	62–65*	..
4,940,000	"	May 14	9	4 1/2%	Imperial Continental	150–160	117–122	117 1/2–119 3/8
1,295,000	"	Feb. 12	8 1/2	8 1/2%	Do. 3 1/2 p.c. Deb. Red.	84–86	72–74	72 1/2
295,242	"	Mar. 12	6 1/2	6 1/2%	Lea Bridge Ord. 5 p.c.	119–121	93–98	95–95 1/2
2,498,905	"	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A	211–213	82–84	..
306,088	"	June 26	4	4%	{ B	146–148	..	..
165,736	"	Aug. 15	4 1/2	4 1/2%	Do. 4 p.c. Pr. Deb. Stk.	..	71–73	..
15,000	5	June 11	6	3%	Maidstone 5 p.c.	..	60–65	..
350,000	100	April 1	4 1/2	4 1/2%	Malta & Mediterranean Met. of Melbourne { 4 1/2 p.c. Deb.	4 1/2–4 3/8	3 1/2–3 3/8	..
541,990	20	May 28	4	6/-		99–101	90–97	..
1,875,892	Stk.	July 29	4 1/2	3 1/2%	Monte Video, Ltd.	11 1/2–12	9 1/4–9 7/8	9 3/8–9 1/2
529,705	"	June 26	3 1/2	3 1/2%	Newcastle&Gatsh'd Con.	98 1/2–99 1/2	72 1/2–73 1/2	73
55,940	10	Feb. 26	7/14/0	7/-	Do. 3 1/2 p.c. Deb.	82–83	57–59	..
300,000	Stk.	May 14	8	8%	North Middlesex 7 p.c.	14–15	9 1/2–10 1/2	..
60,000	5	Mar. 26	10	1/-	Oriental, Ltd.	117–122	103–105	..
60,000	50	Feb. 26	18	9%	Ottoman, Ltd.	7 1/2–7 3/8	4–5	..
100,000	50	"	12	6%	Portsea, Island B	128–131	78–83	..
949,980	5	April 29	8	—	Do. C	118–121	60–65	..
499,960	5	June 26	5	—	Primitiva Ord.	5 1/2–6	1 3/8–2 1/2	35/—57/6
521,600	100	June 9	4	4%	Do. 5 p.c. Pref.	4 1/2–5	3 3/8–3 5/8	62/6–65/-
600,000	Stk.	July 31	4	4%	Do. 4 p.c. Deb.	91–98	74–76	..
846,198	"	June 26	4	4%	Do. " 1911	..	47–50	..
150,000	10	May 14	6	6/	River Plate 4 p.c. Deb.	85–87	55–60	..
125,000	50	July 1	5	5%	Sao Paulo { 6 p.c. Pref.	10 1/4–11	7 1/2–8 1/4	..
185,000	Stk.	Mar. 12	10	10%	{ 5 p.c. Deb.	47–49	40–42	..
209,984	"	"	10	10%	Sheffield A	223–224	170–173	..
528,500	"	"	10	10%	Do. B	222–224	170–173	..
183,201	Stk.	Sept. 12	4	4%	Do. C	220–222	168–170	168
90,000	10	May 28	9	6/-	Shrewsbury 5 p.c.	..	..	..
5,609,895	Stk.	Feb. 10	5/4/0	32/-	South African	10 1/2–11 1/2	13–14	..
250,000	"	July 12	—	5%	South Met. 4 p.c. Ord.	111–113	76–77	76–76
1,895,445	"	July 10	3	3%	Do. Pref.	..	92–94*	..
224,820	"	Feb. 26	6 1/2	6%	Do. 3 p.c. Deb.	73 1/2–74 1/2	54–56*	54 1/2–55 3/4
962,795	"	"	6	3 1/2%	South Shields Con. Stk.	157–159	114–116	..
60,000	"	"	5	5%	S'th Suburb'n Ord. 5 p.c.	114–116	77–80	78 1/2–79
185,000	"	Feb. 26	5	3 1/2%	Do. 5 p.c. Pref.	110–119	76–78	..
187,558	Stk.	June 26	5	5%	Do. West Kent	..	..	..
647,740	"	May 14	5	3%	Do. 5 p.c. Deb. Stk.	116–118	87–90	..
190,000	"	Feb. 12	7 1/2	5 1/2%	Southampton Ord.	99–102	67–70	..
789,275	"	"	6	4%	Tottenham { A 5 p.c.	135–138	92–97	..
181,355	"	June 26	4	4%	District { B 3 1/2 p.c.	115–117	67–69	..
185,880	10	Dec. 30	5	—	{ 4 p.c. Deb.	87–89	64–65	65 1/2
149,900	10	July 1	5	5%	Tuscan, Ltd.	5–6	1–2	..
296,476	Stk.	Mar. 12	5	5%	Do. 5 p.c. Deb. Red.	93–95	45–50	..
					Tynemouth 5 p.c. max.	108 1/2–109	87–88	..
80,000	"	Feb. 26	8 1/2	63/9	Wandsworth, Wimbledon, and Epsom—			
255,636	"	"	6 1/2	48/9	Wandsworth A 5 p.c.	151–156	90–95	92 1/2–93 1/2
352,000	"	"	6 1/2	42/6	Do. B 3 1/2 p.c.	129–134	70–75	73
98,000	"	"	6 1/2	48/9	Wimbledon 5 p.c.	117–123	70–75	..
88,416	"	June 26	3	8%	Epsom 5 p.c.	121–126	73–77	..
					3 p.c. Deb. Stk.	68–69	50–52	60

* *Ex div.*

Charge of Stealing a Gas Company's Safe.—At the Newcastle Police Court, two men were remanded on a charge of having broken and entered an office situated in the yard of the Elswick Gas-Works, Tyneside Road, between Dec. 16 and 17, and stolen a safe, valued at £5, containing £39 18s. 11d., the property of the Newcastle and Gateshead Gas Company.

Wages at Aberdeen.—At a meeting of the Aberdeen Town Council, a letter was read from Mr. J. Addison, the Scottish Organizer of the National Union of General Workers, applying on behalf of members employed at the gas-works for an increase of 10s. on existing rates, and 5s. for juniors, and the establishment of a 47-hour week for all classes of workers in the industry.

Difficulties Overcome at Holbeach.—After preparations had been made for cutting-off the supply at an early hour in the evening, the Directors of the Holbeach Gas Company decided to retain the services in an advisory capacity of Mr. H. Blakey (the Manager of the Spalding Gas-Works), with the result that the situation soon became easier, and there is now every prospect that, with his assistance, the Directors will be able to adequately supply the townspeople with light.

Stretford's Proposed Purchase of a Power Company.—At a meeting of ratepayers on Monday of last week, approval was given of a Bill promoted by the Stretford District Council, providing, *inter alia*, for the purchase of the Trafford Power and Light Company, Limited. It may be recalled that in 1914 the Manchester Corporation applied to Parliament for sanction to purchase the Trafford Power and Light undertaking; but, with the opposition of the Stretford Council, the proposal fell through. The opinion was held then that the Stretford Council, being the statutory authority, was the proper party to acquire the undertaking.

Sunderland Gas Company's Bill.—A resolution has been unanimously passed by the shareholders of the Sunderland Gas Company approving of the promotion of a Bill in Parliament granting powers to the Company to extend the limits of supply and acquire new land at Hendon and Ayres Quay. They proposed also, the Chairman (Alderman W. F. Vint) said, to create a uniform stock, to be called the new consolidated stock, which automatically would increase the capital of the Company by £239,541. This would give them the same return as before; and it would not in any way affect the market value of the shares they now held. A clause would be put in the Bill giving the Directors power to establish certain funds for the benefit of their employees.

Effect of Miners' Demands on Gas Production.—If the miners' wage demands are conceded in their entirety, the effect upon industry generally, and the gas industry in particular, will be enormous. To cover the suggested increase, an advance of 4s. per ton of coal will be needed; and gas undertakings are already figuring-out what this would mean to them. On the basis mentioned, the coal bill of the Manchester Corporation Gas Department, for example, would, according to a reliable estimate, be between £80,000 and £100,000 more this year than last; and an advance of 4d. to 6d. per 1000 c.ft. of gas would, in these circumstances, probably be made. For the Electricity Department of the Corporation an additional expenditure upon coal of approximately £35,000 would result.

Athlone Gas-Works.—An offer for the purchase of the Athlone Gas-Works has been made to the Town Council by a South of Ireland company.

Gas Supply Curtailed at Goole.—The Goole Council have decided to curtail the supply of gas in the town by reducing the pressure in the evenings. This action was taken as a result of a report that the stocks of coal at the gas-works were very limited, and the prospect of immediate supplies uncertain through the labour unrest.

Export of Coal-Tar Pitch.—The Director of the War Trade Department announces that an open general licence has been issued permitting the export of coal-tar pitch to all destinations, except destinations in European and Asiatic Russia and in other foreign countries in Europe or on the Mediterranean Sea other than Italy and Italian Possessions, Belgium, Portugal, Spain, Greece, Morocco, other than French Morocco, Palestine and Syria, as far North as a line from Alexandretta to Aleppo inclusive, and as far East as the Hejaz railway inclusive.

Explosion at Devonport.—An explosion, which resulted in the breaking of a good deal of glass and some other damage to property, occurred last Thursday in Tavistock Street, Devonport. About noon, when the adjoining main thoroughfare was crowded with men leaving the Dockyard for dinner, the cover of an electric sub-station was projected into the air with a report which was heard some miles away. The cover—an iron frame filled with cement, weighing nearly 2 cwt.—was projected over the roofs of two neighbouring shops, and fell on the next premises, piercing the roof and the intervening floors until it reached the ground floor. Many windows were broken by the concussion; but only one person was hurt—a man who was passing being cut on the face and head by glass splinters. It is supposed that the explosion was caused by an accumulation of gas in the sub-station. Neighbouring shopkeepers had noticed a smell of gas for a few days previously, but had not reported it; and it is presumed that the explosion was caused by a lighted match being dropped. The electric fittings in the chamber were found intact.

Mr. Joseph Hull, of Rangeworthy, near Bristol, a member of the G. J. Eveson Coal and Coke Company, Ltd., for over thirty years, has been given a seat on the Board.

At Brighouse, after boring operations for a well at Woodvale Silk Mills, gas and water are found coming together up the one pipe The gas will light and burn, and the water is good enough for industrial purposes. The bore pipe, it seems, has passed through rock, coal, and shale; and water, satisfactory in quality, within limits, has been found in abundance. The gas has probably come up through the blue shale strata.

Mr. J. B. Balmforth, the Gas Manager to the Bingley District Council, has been granted permission to take up private work as a consulting engineer in addition to his management duties for the Council. The permission relates to a request by the Silsden District Council that Mr. Balmforth might give them assistance by his advice in a difficulty in which they had been placed in their management by a man being called up. Mr. Balmforth's help was desired pending the release of the man.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under (about 40 words) 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

		ONE YEAR.		HALF-YEAR.		QUARTER.
United Kingdom	Advance Rate:	28/-	..	15/-	..	8/8
	Credit Rate:	32/-	..	16/-	..	9/6
Abroad (in the Postal Union) Payable in Advance		32/6	..	17/-	..	0/-

In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1919 are reminded that this can only be done before the end of January.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

OXIDE OF IRON

FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE

PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C. 2.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Nov. 19, p. 401.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

BENZOL PLANTS FOR GAS-WORKS.

BAGLEY, MILLS, & CO., Ltd.,
92, Victoria Street, Westminster, S.W. 1, Invite inquiries from all Gas-Works making 75 million cubic feet and upwards per annum.

"FERROX." "FERROX." "FERROX."

A BRITISH Oxide Cheaper and Better than Bog Ore. 35 per cent. Water, 75 per cent. Ferric Hydrate.
For Sale outright or on Loan.
OXIDE LIMITED, Brentford, MIDDLESEX.

OXIDE OF IRON.
SPENT OXIDE BOUGHT.

BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

"TORTO" FIRE CEMENT.

BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.

BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

MEWBURN, ELLIS, AND PRYOR.

CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70, Chancery Lane, London.
Telegrams: "Patent, London." 'Phone: 248 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every Description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, ROSE MOUNT IRONWORKS, ELLAND.

FOR Supplies of SULPHURIC ACID,

ASK BERK.

F. W. BERK & CO., LTD., 1, FENCHURCH AVENUE, LONDON, E.C.3. Works: STRATFORD, LONDON. MORRISTON (GLAM.).
Phone: 4092 Avenue. Tele: "Berk, Phone London."

BRITISH GAS PURIFYING MATERIAL.

ENGLISH BOG ORE AND NATURAL HYDRATED OXIDE OF IRON.
SPENT OXIDE BOUGHT.

BRITISH GAS PURIFYING MATERIALS CO., LTD.
(W.T. P. CUNNINGHAM, Chief Proprietor and Managing Director.)
13, ARCADIAN GARDENS, WOOD GREEN, LONDON, N. 22.
Telegrams: "Bripurimat, Wood, London."
'Phone: Palmer's Green 608.

ALDER AND MACKAY, LTD.
(ESTABLISHED 1850).
WET AND DRY METERS,
SLOT AND ORDINARY.
STREET LAMPS AND AUTOMATIC CONTROLLERS.
EDINBURGH.
(See p. 188.)

SULPHURIC ACID.

SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD., with which is amalgamated WM. PEARCE & SONS, LTD., Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN, LONDON."
Telephone—1588 AVENUE (8 lines).

SEND your inquiries for Carburetted HYDROGEN AND BLUE WATER-GAS PLANT, also TAR DEHYDRATING PLANT and other GAS-WORKS APPARATUS to—
BALE AND HARDY,
89, VICTORIA STREET, WESTMINSTER, S.W. 1.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams—"SATURATORS, BOLTON." Telephone 0848.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

EXTENSIONS.—Gas-Works requiring Alterations or Additions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, 15, Park Row, Leeds, who make a Speciality of Gas Apparatus, Coke-Oven Plant, and Structural Steel Work. Inquiries Solicited. Satisfaction Guaranteed. Telephone No. 22579, LEEDS.

INCANDESCENT Gas-Burner Stampings.—Already having Dies for the Stamping of the Ventilator Section, quotations for immediate delivery of these parts can be given to Manufacturers.
DEW, 8, LAURENCE POUNTNEY HILL, E.C. 4.

APPOINTMENTS, &c., WANTED.

GAS Engineer, at present Works Manager of Large Modern Works (3½ Million per diem), Desires Position as ENGINEER, or as ASSISTANT ENGINEER, of a Large Works, or as WORKS MANAGER or SUPERINTENDENT with prospect of Promotion. Colonial or Foreign Appointments considered. Wide Experience. Exceptional Technical Qualifications, Science Degree Medalist, &c. Highest References.
Inquiries, in confidence, to No. 6582, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

WHEN Filling Vacancies, please REMEMBER THE CLAIM OF THE EX-SERVICE MAN, who, other Qualification being equal, has the FIRST CALL ON YOUR CONSIDERATION.

MANAGER and Secretary of Corporation Gas-Works DESIRES CHANGE. Good Record for the Past Sixteen Years.
Address No. 6581, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

AN Engineer, with many years' Experience in Gas-Works Design, Construction, and Practice, also Distribution in all its Branches, will be pleased to Negotiate with Undertakings requiring ASSISTANCE in CARRYING OUT EXTENSIONS, &c.
Address No. 6572, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

CAPTAIN, R.E., Gas Engineer, shortly Returning to the United States to resume Appointment, will have a few weeks to spare in America, and could execute COMMISSIONS. References permitted to Mr. Walter King.
Address No. 6577, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

APPOINTMENTS, &c., VACANT.

GENERAL MANAGER.

IN consequence of the impending Retirement of the Managing Director, after 36 Years' Service, the Directors of the SHEFFIELD GAS COMPANY require the Services of a Gentleman to occupy the Position of GENERAL MANAGER.
Applicants must have had a Thorough Commercial Training and Experience, and must also Possess a Good General Knowledge of Engineering. One who has previously been engaged in work connected with Gas Undertakings preferred.
Applications (which will be regarded as confidential) must state Age, Salary required, and Experience, and be addressed to the CHAIRMAN (Colonel H. K. Stephenson, M.P.), GAS COMPANY'S OFFICES, COMMERCIAL STREET, SHEFFIELD.

BOROUGH OF NELSON.

GAS ENGINEER AND MANAGER.

APPLICATIONS are invited from Fully-Trained and Experienced Gas Engineers, for the above Appointment.
Applicants must possess a Thorough Knowledge of the Manufacture and Distribution of Gas in all its Branches, and be Capable of Designing and Carrying Out all Extensions required by the undertaking.
Candidates with Experience in the Management and Control of Vertical Retorts preferred.
Commencing Salary, £550 per Annum.
Applications, stating Age, present Appointment, and Experience, and enclosing Three recent Testimonials, to be lodged with me, endorsed "Gas Engineer," not later than 10 a.m., on Monday, the 10th of February prox.
Canvassing directly or indirectly will be a Disqualification; but *copies* (16) of Application may be sent, if desired, for Distribution to the Members of the Gas Committee.
J. H. BALDWICK,
Town Clerk.
Town Hall,
Nelson,
Jan. 25, 1919.

ARMAGH GAS LIGHT COMPANY, LTD.

(Annual Make of Gas, about 28,000,000 C.Ft.)

WANTED.—Engineer, to act also as MANAGER and SECRETARY. Free House, Coal, and Gas.
Apply, immediately, with full Particulars, stating Salary required to W. J. BEST, Esq., J.P., Chairman, RUSSELL STREET, ARMAGH.
Armagh, Jan. 16, 1919.

THE Portsea Island Gas Light Company invite Applications for the Position of ASSISTANT ENGINEER and CHIEF DRAUGHTSMAN, at a Commencing Salary of £375 per Annum.
Applications, giving Age, full Particulars of Training, and Experience, including Distribution, and accompanied by not more than Three recent Testimonials, to be addressed to the Chairman, endorsed "Assistant Engineer," not later than Tuesday, Feb. 11 next.
H. A. STIBBS,
Secretary.
Chief Offices,
Town Hall Square,
Portsmouth.

WANTED — Draughtsmen, with Structural and Mechanical Engineering Experience. Knowledge of Gas-Works Carbonizing Plant and Labour-Saving Machinery an advantage.
Apply, by letter, stating Details of Experience and Salary required, to No. 6580, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

WANTED by Large London Gas-Works, a DRAUGHTSMAN thoroughly conversant with Gas-Works Plant. To be Experienced in Structural Steel Work, and also to have Good General Engineering Knowledge.
Applications, stating Age, Experience, and Full Particulars, to No. 6578, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

MUNICIPALITY OF SINGAPORE, STRAITS SETTLEMENTS.

(GAS ENGINEER'S DEPARTMENT.)

ASSISTANT GAS ENGINEER.

THE Municipal Commissioners of the Town of Singapore require an ASSISTANT GAS ENGINEER, about 30 Years of Age, of Sound Constitution, and Unmarried. He must have had a good Technical Education, a regular Training as a Gas Engineer, with general all-round Experience, including Carbonizing Machinery, both in the Design and in the Construction of New Works and in Ordinary Maintenance. The Engagement will be for Three Years; and the Applicant is to state the earliest date upon which he could be free to leave for Singapore. The selected Candidate must pass a Medical Examination as to his Fitness for Service in a Tropical Climate. A Second-Class Passage will be provided by Mail Steamer, or a First-Class Passage by other Steamer, with Half-Pay during the voyage out. The Salary will be 4200 dollars for the First, 4500 dollars for the Second, and 4800 dollars for the Third Year, paid Monthly; the value of the dollar being 2s. 4d. (two shillings and fourpence) sterling. Such local transport allowance as may from time to time be sanctioned by the Commissioners will be paid, and free unfurnished quarters will be provided.
Applications, endorsed on the cover "Assistant Gas Engineer," stating Age and Place of Birth, and giving details of Education, Training, and Experience generally, and in Carbonizing Machinery, referring to the above requirements seriatim, and stating when free, accompanied by *copies* only of Testimonials, and also Personal References, to be lodged with Messrs. C. C. LINDSAY & PEIRCE, M.M.Inst.C.E., 180, HOPE STREET, GLASGOW (Agents to the Municipal Commissioners), from whom Further Information may be obtained, not later than Wednesday, the 5th of February, 1919.

THE Cardiff Gas Light and Coke COMPANY require a qualified ANALYTICAL CHEMIST, who must be Conversant with Gas Testing, Modern Gas-Works Analyses, including Coal Testing, Tar and Ammoniacal Liquor Distillations, and the other Duties appertaining to that Department.
Salary to commence, £200 per Annum.
Applications, addressed to the Chairman, stating Age, Experience, and present position, together with *copies* of not less than three recent Testimonials, to be sent to the undersigned, endorsed "Chemist," not later than Monday, Feb. 3, 1919.
Canvassing directly or indirectly will disqualify.
By Order,
GEORGE CLARRY,
General Manager and Secretary.
Gas Offices,
Cardiff,
Jan. 14, 1919.

COUNTY BOROUGH OF WALSALL.

(GAS DEPARTMENT.)

THE Gas Committee are desirous of obtaining immediately the Services of a Competent WORKS FOREMAN—one who has had General Experience in a Middle Size Works.
Wages, £4 per Week, *plus* 12½ p.ct. War Bonus. No House supplied.
Application, in own writing, with Three recent Testimonials, addressed to the undersigned, and marked "Works Foreman," not later than Feb. 7.
B. W. SMITH,
Engineer and Manager.
Gas-Works,
Pleck,
Walsall.
Jan. 23, 1919.

WANTED — for Gas-Works in the Metropolitan Area, a CARBONIZING FOREMAN with Experience of Inclined and Vertical Retorts. Carburetted Water-Gas Plant. Eight-Hour Shifts. Three Weeks' Summer Holiday with Pay, after Twelve Months' Service. Wages to commence, £3 17s. 5d. (including War Wage), *plus* 12½ p. ct. Bonus, per Week.
Applications, by letter, stating Age, Experience, &c., with References, to be sent to No. 6575, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

WANTED—Works Fitter. Wages, 1s. per Hour, *plus* 8s. 6d. War Bonus, *plus* 12½ p. ct. on Total Earnings.
Apply to the MANAGER, GAS-WORKS, ABERTILLERY.

WANTED—Two Gas-Fitters accustomed to all kinds of District Work.
Applications, stating Age and Experience, should be addressed to the ENGINEER and MANAGER, GAS-WORKS, REDCAR.

SPALDING URBAN DISTRICT COUNCIL.

WANTED—A Gas Fitter well up in Iron and Compo. Work, and Main Laying. Must be able to attend to Complaints.
Apply, stating Age and Wages required, to the ENGINEER, GAS-WORKS, SPALDING, Lincs.

WANTED—A Competent Gas-Fitter, thoroughly understanding all Modern Lighting and Heating Appliances, and able to do Main and Service Laying.
Apply, giving References and stating Experience and Wages required, to Mr. W. MILLAR, NIXON'S NAVIGATION COMPANY, LTD., MOUNTAIN ASH.

WANTED, Operator for Hird Tar Dehydrating Plant.
Applicants to state Wages required and Particulars of Experience, to the MANAGER, GAS-WORKS, ABERTILLERY.

H. & J. DEMPSTER, LTD. ELSWICK WORKS, BROADWAY, WESTMINSTER, S.W. 1. KENTISH TOWN, N.W. MANCHESTER. H. ITTNER, PATENT SLOT METER PAD & OTHER LOCKS.